SNOMED CT® User Guide

January 2011 International Release
(US English)

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Chapter

1

Preface

Topics:

1.1. Purpose

This document describes the content, structure and terminology of SNOMED CT. It is intended to provide new as well as experienced users with an overview and illustrations of SNOMED CT's capabilities and uses from a content perspective. As such, it explains the content and the principles used to model the terminology.

1.2. Who should read this guide?

The intended audience for the User Guide includes clinical personnel, business directors, software product managers, and project leaders who are involved in the acquisition, implementation and use of SNOMED CT and SNOMED CT enabled applications in their organizations. While an information technology background may be helpful, it is not required to benefit from this User Guide.

Technical professionals who support the implementation of SNOMED CT or who develop systems that will use SNOMED CT may find this guide helpful in providing a high-level overview of the terminology structure and content. However, for detailed technical guidance, technical professionals should consult the *SNOMED CT Technical Reference Guide* (TRG) and *SNOMED CT Technical Implementation Guide* (TIG), as well as other applicable technical documentation described in the Inventory of Documentation.

1.3. Notation used in this document

The following notation is used in this User Guide to represent key types of SNOMED CT information:

SNOMED CT Concept names are generally represented using the Fully Specified Name in mixed case formatted as in the following example:

Example: |Peribronchial pneumonia (disorder)|

SNOMED CT Attribute names are represented in all capital letters formatted as in the following example:

Example: |FINDING SITE|

1.4. Status

This guide contains parts and sections which differ in terms of the authority and status of their content. Each section of the guide is marked to indicate its publication type and status using the symbols shown in *Table 1: Document Types* on page 9 and *Table 2: Document Status* on page 9.

Table 1: Document Types

Type Name and Description	Draft	Review	Current
Standard A document or other resource that is intended to be authoritative. This includes specifications of SNOMED CT content and release files. Normative requirements for particular functions are also standards.	*S*	*S*	*S*
Guidance A document or other resource that is intended to provide advice or suggest possible approaches to particular requirement or subject area.	*G*	*G*	*G*

Table 2: Document Status

Status Name and Description	Standard	Guidance
Current Indicates that the document or resource is considered to be up-to-date and complete for the current release of SNOMED CT (indicated by an explicitly stated version date or by the publication date).	*S*	*G*
Review Indicates that the document or resource has been released for review and comments from SNOMED CT users and other stakeholders. It is intended to be complete but has not been formally approved as a final version.	*S*	*G*
Draft Indicates that the document or resource is a draft version. It may be incomplete and has not been approved in a final version.	*S*	*G*

This edition of the document is configured to use US English .

The PDF version of this draft is formatted to be printed on US Letter paper.

👉 **Note:** This is one of a several large documents that are regularly revised by the IHTSDO. Therefore, for the sake of the environment, please think carefully before deciding to print the entire document.

1.5. Additional information

Further information about SNOMED CT is available by contacting IHTSDO:

1.5.1. IHTSDO Contact Details

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1.6. Inventory of Documentation

The following essential SNOMED CT documentation is currently available in both English and Spanish versions as part of the International Release of SNOMED CT from the International Health Terminology Standards Development Organization (IHTSDO):

SNOMED CT Technical Reference Guide (TRG)

The TRG is intended for SNOMED CT implementers, such as software developers. The TRG assumes an information technology background. Clinical knowledge is not a prerequisite.

The TRG contains reference material related to the current release of SNOMED CT and includes file layouts, field sizes, required values and their meanings, and high-level data diagrams. It can be used to install and use SNOMED.

SNOMED CT Technical Implementation Guide (TIG)

The TIG is intended for SNOMED CT implementers, such as software designers. The TIG assumes information technology and software development experience. Clinical knowledge is not required, although some background is helpful to understand the application context and needs.

The TIG contains guidelines and advice about the design of applications using SNOMED CT, and covers topics such as terminology services, entering and storing information, and migration of legacy information.

SNOMED CT User Guide

The User Guide is intended for clinical personnel, business directors, software product managers, and project leaders; information technology experience, though not necessary, can be helpful.

The User Guide is intended to explain SNOMED CT's capabilities and uses from a content perspective. It explains the content and the principles used to model the terminology.

1.6.1. Additional Documentation

The following supplementary documentation is also included, in English only, as part of the International Release of SNOMED CT:

- *Technical Reference Guide*
- *User Guide*
- *Editorial Guide*

- *Technical Implementation Guide*
- *Namespace Identifier Guide*
- *Namespace Identifier Registry*
- *File Naming Convention*
- *Stated Relationships Guide*
- *Developer Toolkit Guide*
- *Canonical Table Guide*
- *RF2 Data Structures Specification*
- *RF2 Reference Set Specifications*
- *RF2 Update Guide*

1.7. Document History

Version	Notes
January 2006	- Modified guide organization and structure - Updated descriptions and examples for SNOMED CT attributes and hierarchies - Added overview of SNOMED CT structure and technology considerations - Revised glossary
July 2006	- Added section on the use of attributes for *Event* hierarchy - Updated Attributes used to define Clinical findings: modifications were made to use of SEVERITY, EPISODICITY and PATHOLOGICAL PROCESS. - Renamed *Context-dependent category (context-dependent category)* hierarchy to *Situation with explicit context (situation)* - Updated Attributes used to define Procedure concepts: added ROUTE OF ADMINISTRATION as an attribute
January 2007	- Update to Attributes used to define Clinical findings: COURSE and ONSET were retired; CLINICAL COURSE was introduced - Update to Attributes used to define Procedure concepts - Retired USING and ACCESS INSTRUMENT and replaced with USING DEVICE and USING ACCESS DEVICE - Changes to ACCESS attribute - New attributes USING SUBSTANCE and USING ENERGY - New range for LATERALITY attribute - Changes to range for PROCEDURE SITE and FINDING SITE and SPECIMEN SOURCE TOPOGRAPHY - Added section on use of attribute for *Physical object* hierarchy - Updates to Examples

Version	Notes
July 2007	• Updates to reflect transfer of IP to the International Health Terminology Standards Development Organization • Removal of references to College of American Pathologists (CAP) derivative products • Information provided on anticipated changes to Attributes used to define Procedure concepts: • ACCESS • APPROACH • Changes to value for HAS DOSE FORM for Pharmaceutical / biologic products
January 2008	• Changes to Attributes used to define Procedure concepts • New attribute SURGICAL APPROACH • Retired APPROACH • Changes to description for attribute RECIPIENT CATEGORY • Changes to the range for ASSOCIATED FINDING and additional guidance on the use of ASSOCIATED FINDING and ASSOCIATED PROCEDURE in post-coordinated expressions
July 2008	• Changes to domain for Attribute ROUTE OF ADMINISTRATION • Discussion on the References Table • Update on [D], [M], [X], [V], [SO], [Q], and [EDTA] concepts in an appendix • Discussion of Negation was added to an appendix
January 2009	• Changes to the range for attributes in the ASSOCIATED WITH role hierarchy for precoordinated content • Changes to the range for DIRECT SUBSTANCE for precoordinated content • Clarification of the range for attributes in the PROCEDURE DEVICE role hierarchy • Change to the range for SPECIMEN SOURCE IDENTITY
July 2009	• Changes to the range of attributes that take an anatomical value: • Changes to the range for FINDING-SITE • Changes to the range for PROCEDURE SITE attributes • Changes to the range for SPECIMEN SOURCE TOPOGRAPHY • Changes to the range for INTERPRETS and HAS INTERPRETATION • Changes to the range for PATHOLOGICAL PROCESS • Changes to the domain for the six attributes previously identified for use with Measurement procedures • Changes to the range for LATERALITY

Version	Notes
October 2009 - guide update	• Updated presentation of attribute ranges (allowable values) to reflect machine-readable concept model work • Changed method of generating document from MS Word to DITA • Overall appearance change and revised order of front matter • Revised figures and diagrams so they can be shared SVG images • Added appendix "Changes and historical notes" • Changed "Role hierarchies" to "Attribute hierarchies" • Updated and clarified wording in several sections
January 2010	• Added information about the metadata hierarchy and related changes, which are part of the January 2010 Technology Previews and will be incorporated into a future International Release • Added paragraph on allowable domains in post-coordinated expressions • Revised several glossary entries and aligned them to be identical with *Technical Reference Guide* glossary entries • Expanded scope of User Guide to include new editorial policies that are currently being implemented in the International Release, but with which the terminology may not yet be fully compliant • Improved formatting and layout of the DITA-generated document
July 2010	• Updated information about the metadata hierarchy and related changes that will support implementation of the RF2 release format • Incorporated formatting changes and example changes resulting from integrating the work on the Technical Implementation Guide • Removed outdated historical sections from the appendix regarding the original merger of SNOMED and the Read Codes and content development processes; for current information about quality processes and content development procedures, users should refer to updated materials from the various IHTSDO Committees.
January 2011	• Added status icons to indicate status of individual sections • Added section numbering • In addition to pdf document, the guide is released in html and help format.

1.8. Copyright Notice

Chapter

2

Overview

Topics:

- *What is SNOMED CT?*
- *SNOMED CT uses*

2.1. What is SNOMED CT?

SNOMED Clinical Terms (SNOMED CT) is a comprehensive clinical terminology that provides clinical content and expressivity for clinical documentation and reporting. It can be used to code, retrieve, and analyze clinical data. SNOMED CT resulted from the merger of SNOMED Reference terminology (SNOMED RT) developed by the College of American Pathologists (CAP) and Clinical Terms Version 3 (CTV3) developed by the National Health Service (NHS) of the United Kingdom. The terminology is comprised of concepts, terms and relationships with the objective of precisely representing clinical information across the scope of health care. Content coverage is divided into hierarchies, which include:

Table 3: Top Level Concepts

• | Clinical finding | • | Procedure | • | Observable entity | • | Body structure | • | Organism | • | Substance | • | Pharmaceutical / biologic product | • | Specimen | • | Special concept | • | Linkage concept |	• | Physical force | • | Event | • | Environment or geographical location | • | Social context | • | Situation with explicit context | • | Staging and scales | • | Physical object | • | Qualifier value | • | Record artifact |

2.2. SNOMED CT uses

Health care software applications focus on collection of clinical data, linking to clinical knowledge bases, information retrieval, as well as data aggregation and exchange. Information may be recorded in different ways at different times and sites of care.

Standardized information improves analysis. SNOMED CT provides a standard for clinical information. Software applications can use the concepts, hierarchies, and relationships as a common reference point for data analysis. SNOMED CT serves as a foundation upon which health care organizations can develop effective analysis applications to conduct outcomes research, evaluate the quality and cost of care, and design effective treatment guidelines.

Standardized terminology can provide benefits to clinicians, patients, administrators, software developers and payers. A clinical terminology can aid in providing health care providers with more easily accessible and complete information pertaining to the health care process (medical history, illnesses, treatments, laboratory results, etc.) and thereby result in improved patient outcomes. A clinical terminology can allow a health care provider to identify patients based on certain coded information in their records, and thereby facilitate follow-up and treatment.

Chapter

3

Basic Components of SNOMED CT

Topics:

- *Concepts*
- *Descriptions*
- *Relationships*

$\boxed{S}$ 3.1. Concepts

In the context of this document, a "concept" is a clinical meaning identified by a unique numeric identifier (ConceptId) that never changes. Concepts are represented by a unique human-readable Fully Specified Name (FSN). The concepts are formally defined in terms of their relationships with other concepts. These logical definitions give explicit meaning which a computer can process and query on. Every concept also has a set of terms that name the concept in a human-readable way.

$\boxed{S}$ 3.1.1. Concept granularity

The meaning represented by a *Concept* can be general (for example | procedure |), specific (for example |excisional biopsy of lymph node|) or somewhere in between (for example | biopsy of lymph node |).

- More specific *Concepts*:

    - Have finer granularity (more granular);
    - Represent clinical detail.

- More general *Concepts*:

    - Have coarser granularity (less granular);
    - Represent less clinical detail;
    - Aggregate similar *Concepts*.

Support for multiple levels of granularity allows *SNOMED CT* to be used to represent clinical data at a level of detail that is appropriate to a range of different uses.

Concepts with different levels of granularity are linked to one another by | is a | *relationships*. This enables appropriate aggregation of specific information within less detailed categories.

Figure 1: Multiple levels of granularity

S 3.1.2. Concept identifiers

Each *SNOMED CT Concept* has a permanent unique numeric identifier which is known as the *ConceptId*.

The sequence of digits in a *ConceptId* does not convey any information about the meaning or nature of the *Concept* [1]. The meaning of *Concept* is represented in human-readable forms by *Descriptions* and in a computer processable form by *Relationships* with other *Concepts*.

The advantages of meaningless identifiers include:

- Identifier permanence without undermining interpretation:
  - In contrast, to maintain consistency, a meaningful code may need to change to reflect revised understanding of the nature of a disorder. .

- Enabling multiple aspects of meaning to be represented in the same way:
  - A meaningful code can only represent part of meaning of a complex *concept*. For example, |staphylococcal pneumonia| is an |infection|, a |respiratory disorder| and a |disorder| caused by |staphylococcus| but only one of these aspects can be represented by a code based *hierarchy*. Thus in the 'J' in the *ICD10* code 'J152: Pneumonia due to staphylococcus' represents that fact that this is a respiratory disorder but does not represent the fact that it is an infection (codes starting with 'A') or that it is due to staphylococcus ('A490: Staphylococcal infection, unspecified').

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[1] The use of meaningless identifiers differs from the approach taken by some other coding systems and classifications. For example, the first character of an ICD10 code indicates the general classification that it falls within.

- No artificial limitation on *concept* granularity:

  - Typical approaches to meaningful coding impose limits on both the number of levels of specificity (i.e. the length of the code) and the number of options at each level (i.e. the number of different symbols that can be used in each character position).

S 3.2. Descriptions

Concept descriptions are the terms or names assigned to a SNOMED CT concept. "Term" in this context means a phrase used to name a concept. A unique DescriptionId identifies a description. Multiple descriptions might be associated with a concept identified by a ConceptId.

Example:

Some of the descriptions associated with ConceptId 22298006:

- Fully Specified Name: |Myocardial infarction (disorder)| DescriptionId 751689013
- Preferred term: Myocardial infarction DescriptionId 37436014
- Synonym: Cardiac infarction DescriptionId 37442013
- Synonym: Heart attack DescriptionId 37443015
- Synonym: Infarction of heart DescriptionId 37441018

Each of the above descriptions has a unique DescriptionId, and all of these descriptions are associated with a single Concept (and the single ConceptId 22298006).

S 3.2.1. Types of descriptions

S 3.2.1.1. Fully Specified Name

Each *concept* has one *Fully Specified Name* (FSN) intended to provide an unambiguous way to name a *concept*. The purpose of the FSN is to uniquely describe a *concept* and clarify its meaning. The FSN is not a commonly used term or natural phrase and would not be expected to appear in the human-readable representation of a clinical record.

👉 **Note:** The term in each FSN is unique across the entire active content of a SNOMED CT Release.

Each FSN term ends with a "semantic tag" in parentheses. The semantic tag indicates the semantic category to which the *concept* belongs (e.g. clinical finding, disorder, procedure, organism, person, etc.). The "semantic tag" helps to disambiguate the different *concept* which may be referred to by the same commonly used word or phrase.

👉 **Example:** | Hematoma (morphologic abnormality) | is the FSN of the *concept* that represents the "hematoma" that a pathologist sees at the tissue level. In contrast, | Hematoma (disorder) | is the FSN of the *concept* that represents the clinical diagnosis that a clinician makes when they decide that a person has a "hematoma".

S 3.2.1.2. Preferred Term

Each *concept* has one *Preferred Term* in a given language dialect. The *Preferred Term* is a common word or phrase used by clinicians to name that *concept*.

👉 **Example:** the *concept* 54987000 | repair of common bile duct (procedure) | has the *Preferred Term* | choledochoplasty | to represent a common name clinicians use to describe the procedure.

Note: Unlike the *Fully Specified Name* (FSN) the *Preferred Terms* need not be unique. Occasionally, the *Preferred Term* for one *concept* may also be a *Synonym* or the *Preferred Term* for a different *concept*.

Example:

- | Cold sensation quality (qualifier value) | has a *preferred term* of "Cold";
- | Common cold (disorder) | also has a *synonym* of "Cold".

In both cases, "cold" represents a common clinical phrase used to capture the meaning of the *concept*.

3.2.1.3. Synonym

A *synonym* represents a *term*, other than the FSN or *Preferred Term*, that can be used to represent a *concept* in a particular language or dialect.

Example: *Synonyms* of the *concept* 22298006 | myocardial infarction (disorder) | in English include:

- | cardiac infarction | (Description.id: 37442013);
- | heart attack | (Description.id: 37443015);
- | infarction of heart | (Description.id: 37441018).

The *Preferred Term* for this *concept* in English is: | myocardial infarction | (Description.id: 37436014).

Note: *Synonyms*, like *Preferred Terms*, are not required to be unique.

3.3. Relationships

Relationships link concepts in SNOMED CT. There are four types of relationships that can be assigned to concepts in SNOMED CT:

- Defining
- Qualifying
- Historical
- Additional

The relationships addressed in this section are known as "defining" relationships which are used to model concepts and create their logical definitions.

3.3.1. Relationships and concept definitions

Each *concept* in *SNOMED CT* is logically defined through its *relationships* to other *concepts*.

Every *active SNOMED CT concept* (except the *SNOMED CT Concept Root concept*) has at least one | is a | *relationship* to a supertype *concept*.

| is a | *relationships* and defining attribute *relationships* are known as the *defining characteristics* of *SNOMED CT concepts*. They are considered defining because they are used to logically represent a *concept* by establishing its *relationships* with other *concepts*. This is accomplished by establishing | Is a | *relationships* with one or more defining *concepts* (called supertypes) and *modeling* the difference with those supertypes through defining attributes.

Example: | Fracture of tarsal bone (disorder) | is defined as:

- | is a | subtype of | Fracture of foot (disorder) |
- and has | finding site | | Bone structure of tarsus (body structure) | ;

- and has | associated morphology | | Fracture (morphologic abnormality) | .

👉 **Note:** A *relationship* is assigned only when that *relationship* is always known to be true.

👉 **Example:** Group A Streptococcus causes most cases of Streptococcal pharyngitis. However, a small percentage of these cases are caused by other species of Streptococcus. Therefore, it would be incorrect to define | Streptococcal sore throat (disorder) | as having | causative agent | | Streptococcus pyogenes (organism) |. Instead it is correctly defined as having the more general | causative agent | | Genus Streptococcus (organism) |.

S 3.3.2. IS A relationships

| is a | *relationships* are also known as "Supertype - *Subtype relationships*" or "Parent - *Child relationships*". | is a | *relationships* are the basis of *SNOMED CT*'s hierarchies, as illustrated below.
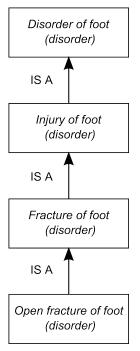
Figure 2: Example IS A hierarchy

A *concept* can have more than one | is a | *relationship* to other *concepts*. In that case, the *concept* will have parent *concepts* in more than one sub - *hierarchy* of a top-level *hierarchy*. *Subtype relationships* can be multi-hierarchical.
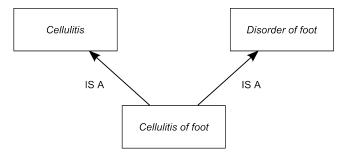
Figure 3: Example IS A relationships

S 3.3.3. Attribute relationships

An *attribute Relationship* is an association between two *concepts* that specifies a *defining characteristic* of one of the *concepts* (the source of the *Relationship*). Each *Attribute Relationship* has a name (the type of *Relationship*) and a value (the destination of the *Relationship*). For example

The combination of the *attribute Relationships* and | is a | *relationships* associated with a *concept* represent the logical definition of that *concept*. The logical *concept* definition includes one or more supertypes (represented by | is a | *relationships*), and a set of defining *Attributes* that differentiate it from the other *concept* definitions.

👉 **Example:**

Since pneumonia is a disorder of the lung, the logical definition of the *concept* | Pneumonia (disorder) | in *SNOMED CT* includes the following *Relationship*. The *Attribute* | Finding site | is assigned the value | Lung structure (body structure) |.

• | Finding site | = |Lung structure (body structure)|

The full definitions of the *concepts* | Pneumonia (disorder) |,|Infective pneumonia (disorder)| and |Bacterial pneumonia (disorder)| are shown below. Each line represents a defining *Attribute* with a value.

• | is a | = | pneumonitis |
• , | is a | = | lung consolidation |
• , { | associated morphology | = | inflammation |
• , | associated morphology | = | consolidation |
• , | finding site | = | lung structure | }

Figure 4: Definition of |Pneumonia (disorder)|

• | is a | = | infectious disease of lung |
• , | is a | = | pneumonia |
• , | pathological process | = | infectious process |
• , { | associated morphology | = | inflammation |
• , | associated morphology | = | consolidation |
• , | finding site | = | lung structure | }

Figure 5: Definition of |Infective pneumonia (disorder)|

• | is a | = | bacterial lower respiratory infection |
• , | is a | = | infective pneumonia |
• , | causative agent | = | bacteria |
• , | pathological process | = | infectious process |
• , { | associated morphology | = | inflammation |
• , | associated morphology | = | consolidation |
• , | finding site | = | lung structure | }

Figure 6: Definition of |Bacterial pneumonia (disorder)|

Figure 7: Illustration of Defining Relationships on page 24 illustrates some of these *Relationships* graphically. | is a | *Relationships* relate a *concept* to more general *concepts* of the same type. In contrast, *Attribute Relationships* (such as | Finding site | and | Causative agent |) relate a *concept* to relevant values in other branches of the *subtype hierarchy*.

Figure 7: Illustration of Defining Relationships

Chapter

4

Attributes Used in SNOMED CT

Topics:

S

This part of the Editorial Guide provides an overview of the defining attributes used by the SNOMED CT concept model. Further details are provided in the chapters dedicated to each hierarchy.

S 4.1. Introduction

SNOMED CT currently uses over 50 defining attributes to model *concept* definitions.

Each *SNOMED CT* attribute can usually be applied to one *hierarchy* and for a few attributes to more than one *hierarchy*. The *hierarchy* or hierarchies to which an attribute can be applied are referred to as the "domain" of the attribute. Each attribute can be given a limited set of values; this set of values is called the "range" of the attribute.

S 4.1.1. Domain

The *Domain* is the *hierarchy* to which a specific attribute can be applied.

The *Domain* of the attribute | ASSOCIATED MORPHOLOGY | is the | Clinical finding | *hierarchy*.

A | Procedure | cannot have an | ASSOCIATED MORPHOLOGY |.

A | Procedure | has a | PROCEDURE MORPHOLOGY |.

S 4.1.2. Allowable domains in post-coordinated expressions

The *concept model* provides *constraints* for attributes that are used as defining *relationships*, both in distributed *SNOMED CT* content (so-called *pre-coordinated* definitions) and in *post-coordinated expressions*, as described in the document *Abstract Logical Models and Representational Forms* (available at *www.ihtsdo.org/our-standards/technical-documents/*). The domain (or starting *concept*) to which qualifying *relationships* are applied in *post-coordinated expressions* may be more general than the domain of defining *relationships* defined in the *concept model*, as long as the resulting *post-coordinated concept expression* as a whole satisfies the *concept model constraints*.

For example, the *concept model constraint* for | SURGICAL APPROACH | requires that its domain be | Surgical procedure (procedure) | 387713003. When | SURGICAL APPROACH | is used in a qualifying *relationship* in *post-coordinated expressions*, the starting domain may be a general procedure, if the resulting *expression* satisfies the *concept model constraint*. In other words, when | SURGICAL APPROACH | is added to a general procedure as a qualifying *relationship*, the *post-coordinated expression* should also have a METHOD with a value of | Surgical action (qualifier value) | or one of its *subtypes*, so that the resulting *concept* becomes a *subtype* of | Surgical procedure (procedure) |.

S 4.1.3. Range

The *Range* is the set of values allowed for each attribute.

For example, the *Range* for | ASSOCIATED MORPHOLOGY | is | Morphologically abnormal structure (morphologic abnormality) | and its *descendants*, and the *Range* for | FINDING SITE | is | Anatomical or acquired body structure (body structure) | and its *descendants* in the | Body structure | *hierarchy*.

Figure 8: Example Pneumonia FINDING SITE Lung structure

The *Domain* for the | FINDING SITE | attribute is the | Clinical finding | *hierarchy*. In the above example, the attribute | FINDING SITE | has the value | Lung structure (body structure) |. | Lung structure (body structure) | is found in the | Anatomical structure (body structure) | subhierarchy which is in the allowed range for | FINDING SITE |.

Defining attributes in *SNOMED CT* are assigned to the hierarchies where retrieval of clinical data is most useful and relevant (e.g. | Procedure |, | Clinical finding |, |Pharmaceutical / biologic product|, | Situation with explicit context |, | Event |, | Specimen | and | Physical object |). In addition, | LATERALITY | is a defining attribute applied to | Body structure | *concepts*. Other hierarchies, such as | Social context |, | Substance |, | Organism |, and | Observable entity |, are not assigned attributes and instead are considered supporting hierarchies. *Concepts* from the supporting hierarchies can serve as the *attribute values* for the *concept* definitions of the main hierarchies.

This section describes the approved attributes used in *SNOMED CT*. There are many other attributes in *SNOMED CT*, *subtypes* of | Unapproved attribute (attribute) |, which have not yet been evaluated thoroughly and approved for use.

S 4.2. Attribute Hierarchies in SNOMED CT

Selected *SNOMED CT* attributes have a hierarchical *relationship* to one another known as "attribute hierarchies". In an attribute *hierarchy*, one general attribute is the parent of one or more specific *subtypes* of that attribute. *Concepts* defined using the more general attribute can inherit *concepts* modeled with the more specific *subtypes* of that attribute.

S 4.2.1. Attribute hierarchies used in *modeling* Procedures

Three groups of attributes are organized as a simple two-level *hierarchy*. The three top level attributes are |PROCEDURE SITE|, |PROCEDURE DEVICE|, and |PROCEDURE MORPHOLOGY|. Each has a sub-attribute to represent the direct object, and another to represent the indirect object. In addition, |PROCEDURE DEVICE| can be specialized by the attributes |USING DEVICE| and |USING ACCESS DEVICE|.

|PROCEDURE DEVICE| attribute *hierarchy*:

- |PROCEDURE DEVICE|
  - |DIRECT DEVICE|

- |INDIRECT DEVICE|
- |USING DEVICE|
- |USING ACCESS DEVICE|

|PROCEDURE MORPHOLOGY| attribute *hierarchy*:

- |PROCEDURE MORPHOLOGY|
  - |DIRECT MORPHOLOGY|
  - |INDIRECT MORPHOLOGY|

|PROCEDURE SITE| attribute *hierarchy*:

- |PROCEDURE SITE|
  - |PROCEDURE SITE - DIRECT|
  - |PROCEDURE SITE - INDIRECT|

S 4.2.2. Attribute hierarchy used in *modeling* Clinical Findings

| ASSOCIATED WITH | attribute *hierarchy*:

- | ASSOCIATED WITH |
  - |AFTER|
  - |DUE TO|
  - |CAUSATIVE AGENT|

S 4.3. Attributes used to define Clinical Finding concepts

Table 4: Approved Clinical Finding attributes summary

Defining Attribute	Subsumed Attribute	Allowable Values
|FINDING SITE|		|Anatomical or acquired body structure| 442083009 (<<)
|ASSOCIATED MORPHOLOGY|		|Morphologically abnormal structure| 49755003 (<<)

Defining Attribute	Subsumed Attribute	Allowable Values
|ASSOCIATED WITH|		|Clinical Finding| 404684003 (<<) |Procedure| 71388002 (<<) |Event| 272379006 (<<) |Organism| 410607006 (<<) |Substance| 105590001 (<<) |Physical object| 260787004 (<<) |Physical force| 78621006 (<<) |Pharmaceutical / biologic product| 373873005 (<< Q only) |SNOMED CT Concept| 138875005 (==)
	|CAUSATIVE AGENT|	|Organism| 410607006 (<<) |Substance| 105590001 (<<) |Physical object| 260787004 (<<) |Physical force| 78621006 (<<) |Pharmaceutical / biologic product| 373873005 (<< Q only) |SNOMED CT Concept| 138875005 (==)
	|DUE TO|	|Clinical Finding| 404684003 (<=) |Event| 272379006 (<=)
	|AFTER|	|Clinical Finding| 404684003 (<<) |Procedure| 71388002 (<<)
|SEVERITY|		|Severities| 272141005 (<=)(< Q)
|CLINICAL COURSE|		|Courses| 288524001 (<=)(< Q)
|EPISODICITY|		|Episodicities| 288526004 (<=)(< Q)
|INTERPRETS|		|Observable entity| 363787002 (<<) |Laboratory procedure| 108252007 (<<) |Evaluation procedure| 386053000 (<<)
|HAS INTERPRETATION|		|Findings values| 260245000 (<<)
|PATHOLOGICAL PROCESS|		|Autoimmune| 263680009 (==) |Infectious process| 441862004 (<<)
|HAS DEFINITIONAL MANIFESTATION|		|Clinical finding| 404684003 (<<)

Defining Attribute	Subsumed Attribute	Allowable Values
|OCCURRENCE|		|Periods of life| 282032007 (<)
|FINDING METHOD|		|Procedure| 71388002 (<=)
|FINDING INFORMER|		|Performer of method| 420158005 (<<) |Subject of record or other provider of history| 419358007 (<<)

👉 **Note:**

Meaning of Allowable Values (*Range*) notations:

(<<) this code and descendants,

(<) descendants only,

(<=) descendants only (stated) except for supercategory groupers,

(==) this code only,

(< Q) descendants only when in a qualifying relationship,

(< Q only) descendants only, and only allowed in a qualifying relationship.

S 4.3.1. FINDING SITE

This attribute specifies the body site affected by a condition.

Table 5: Permissible values for FINDING SITE

Attribute Values	Examples
|Anatomical or acquired body structure| 442083009 (<<)	|Kidney disease (disorder)| • |FINDING SITE| |Kidney structure (body structure)|
	|Appendicitis (disorder)| • |FINDING SITE| |Appendix structure (body structure)|

S 4.3.2. ASSOCIATED MORPHOLOGY

This attribute specifies the morphologic changes seen at the tissue or cellular level that are characteristic features of a disease.

Table 6: Permissible values for ASSOCIATED MORPHOLOGY

Attribute Values	Examples
|Morphologically abnormal structure| 49755003 (<<)	|Bone marrow hyperplasia (disorder)| • |ASSOCIATED MORPHOLOGY| |Hyperplasia (morphologic abnormality)|
	|Pancreatitis (disorder)| • |ASSOCIATED MORPHOLOGY| |Inflammation (morphologic abnormality)|

S 4.3.3. ASSOCIATED WITH

This attribute asserts an interaction between two *concepts* beyond simple co-occurrence in the patient. \|ASSOCIATED WITH\| represents a clinically relevant association between *concepts* without either asserting or excluding a causal or sequential *relationship* between the two.

Table 7: Permissible values for ASSOCIATED WITH

Attribute Values	Examples
|Clinical Finding| 404684003 (<<) |Procedure| 71388002 (<<) |Event| 272379006 (<<) |Organism| 410607006 (<<) |Substance| 105590001 (<<) |Physical object| 260787004 (<<) |Physical force| 78621006 (<<) |Pharmaceutical / biologic product| 373873005 (<< Q only) |SNOMED CT Concept| 138875005 (==)	

\|ASSOCIATED WITH\| subsumes the following, more specific, attributes in what is called an attribute *hierarchy* (explained in *Attribute Hierarchies in SNOMED CT* on page 27):

• \|AFTER\|

• \|DUE TO\|

• \|CAUSATIVE AGENT\|

S 4.3.4. AFTER

This attribute is used to model *concepts* in which a clinical finding occurs after another clinical finding or procedure. Neither asserting nor excluding a causal *relationship*, it instead emphasizes a sequence of events.

Table 8: Permissible values for AFTER

Attribute Values	Examples
|Clinical Finding| 404684003 (<<) |Procedure| 71388002 (<<)	|Post-viral disorder (disorder)| • |AFTER| |Viral disease (disorder)|

This example can be paraphrased as: "every post-viral disorder occurs after some viral disease".

S 4.3.5. DUE TO

This attribute is used to relate a |Clinical finding| directly to its cause. If a clinical finding merely predisposes to or worsens another disorder, rather than causing it directly, then the more general attribute | ASSOCIATED WITH | is used instead.

Table 9: Permissible values for DUE TO

Attribute Values	Examples
|Clinical Finding| 404684003 (<=) |Event| 272379006 (<=)	|Cheilitis due to atopic dermatitis (disorder)| • |IS A| |Cheilitis (disorder)| • |DUE TO| |Atopic dermatitis (disorder)|

S 4.3.6. CAUSATIVE AGENT

This attribute identifies the direct causative agent of a disease. It does not include vectors, e.g. a mosquito that transmits malaria.

Table 10: Permissible values for CAUSATIVE AGENT

Attribute Values	Examples
|Organism| 410607006 (<<) |Substance| 105590001 (<<) |Physical object| 260787004 (<<) |Physical force| 78621006 (<<) |Pharmaceutical / biologic product| 373873005 (<< Q only) |SNOMED CT Concept| 138875005 (==)	|Bacterial endocarditis (disorder)| • |CAUSATIVE AGENT| |Superkingdom Bacteria (organism)| --- |Fentanyl allergy (disorder)| • |CAUSATIVE AGENT| |Fentanyl (substance)| --- |Electrical burn of skin (disorder)| • |CAUSATIVE AGENT| |Electricity (physical force)|

S 4.3.7. SEVERITY

This attribute is used to subclass a |Clinical finding| *concept* according to its severity; however, caution is encouraged because this use is said to be *relative*. By relative, it is meant that it is incorrect to assume that the same degree of disease intensity or hazard is implied for all |Clinical finding| to which this attribute is applied. There are three *reasons*.

First, "severe" could be interpreted differently depending on what other values are available to choose for severity. Thus severity is relative to the other values in the value set presented to users. Consider the different meaning of severity in each of the following three sets of values:

- mild / moderate / severe

- minimal / mild / moderate / severe / very severe

- mild / mild to moderate / moderate / moderate to severe / severe / life threatening / fatal

Second, the severity is defined relative to the expected degree of intensity or hazard of the |Clinical finding| that is being qualified. A common cold has a baseline intensity or hazard much less than that of a more serious disease like lupus erythematosus or pneumonia; thus a severe cold might be considered less intense or hazardous than a mild pneumonia.

Third, some disorders that are life-threatening do not ordinarily have a severity assigned to them. Cancer, for example, is generally not subclassed according to mild, moderate and severe types, but rather is subclassed according to stage or grade.

For these *reasons*, the |SEVERITY| attribute cannot be relied on to retrieve all *Clinical findings* with serious or life-threatening import. Nevertheless, it is still useful for subclassing certain *concepts* and differentiating between different severities of a single disorder. SEVERITY is not used to model any *concepts pre-coordinated* in the *International Release* but it can still be used in *post-coordination* as a *qualifier*.

Table 11: Permissible values for SEVERITY

Attribute Values	Examples
|Severities| 272141005 (<=)(< Q)	

S 4.3.8. CLINICAL COURSE

This attribute is used to represent both the course and onset of a disease. Many conditions with an acute (sudden) onset also have an acute (short duration) course. Few diseases with a chronic (long - *term*) course would need to have their onset sub-divided into rapid or gradual *subtypes*, and thus there is no clear need for separating the rapidity of onset from the duration of a disease; based on testing by implementers and *modelers*, a single attribute with values that combine these meanings has clearly been more reproducible and useful than two attributes that attempt to separate the meanings.

Table 12: Permissible values for CLINICAL COURSE

Attribute Values	Examples
|Courses| 288524001 (<=)(< Q)	|Acute amebic dysentery (disorder)| • |CLINICAL COURSE| |Sudden onset AND/OR short duration (qualifier value)|
	|Chronic fibrosing pancreatitis (disorder)| • |CLINICAL COURSE| |Chronic (qualifier value)|

The word acute has more than one meaning, and the meanings are often overlapping or unclear. The word acute may imply rapid onset, short duration, or high severity; in some circumstances it might be used to mean all of these. For morphological *terms* it may also imply the kind of morphology associated with the speed of onset. |Acute inflammation (morphologic abnormality)| does not necessarily have CLINICAL COURSE | Sudden onset AND/OR short duration |, but rather implies polymorphonuclear infiltration; likewise |Chronic

inflammation (morphologic abnormality)| implies mononuclear cell infiltration, not necessarily a chronic course, although inflammation with a chronic course is highly correlated with a lymphocytic infiltration.

⑤ 4.3.9. EPISODICITY

|EPISODICITY| is used to represent episodes of care provided by a physician or other care provider, typically a general practitioner, *not* episodes of disease experienced by the patient. See *EPISODICITY no longer modeled in active content* on page 85, regarding the origin of the attribute. For example, asthma with |EPISODICITY|=| first episode | represents the first *time* the patient presents to their health care provider with asthma. EPISODICITY is not used to model any *concepts pre-coordinated* in the *International Release* but it can still be used in *post-coordination* as a *qualifier*.

Table 13: Permissible values for EPISODICITY

Attribute Values	Examples
|Episodicities| 288526004 (<=)(< Q)	

⑤ 4.3.10. INTERPRETS

This attribute refers to the entity being evaluated or interpreted, when an evaluation, interpretation or " judgment" is intrinsic to the meaning of a *concept*. This attribute is usually grouped with the | HAS INTERPRETATION | attribute.

Table 14: Permissible values for INTERPRETS

Attribute Values	Examples
|Observable entity| 363787002 (<<) |Laboratory procedure| 108252007 (<<) |Evaluation procedure| 386053000 (<<)	| Decreased muscle tone (finding) | • | INTERPRETS | | muscle tone (observable entity) | • | HAS INTERPRETATION | | Decreased (qualifier value) |
	| Abnormal glucose level (finding) | • | INTERPRETS | | Glucose measurement (procedure) | • | HAS INTERPRETATION | | Outside reference range (qualifier value) |

👉 **Note:** For *concepts* in the Measurement finding subhierarchy, the value for | INTERPRETS |should be an Evaluation procedure or a Laboratory procedure rather than an Observable entity.

⑤ 4.3.11. HAS INTERPRETATION

This attribute is grouped with the attribute |INTERPRETS|, and designates the judgment aspect being evaluated or interpreted for a *concept* (e.g., presence, absence, degree, normality, abnormality, etc.).

Table 15: Permissible values for HAS INTERPRETATION

Attribute Values	Examples
|Findings values| 260245000 (<<)	|Decreased muscle tone (finding)| • |INTERPRETS| |Muscle tone (observable entity)| • |HAS INTERPRETATION| |Decreased (qualifier value)|
	|Abnormal glucose level (finding)| • |INTERPRETS| |Glucose measurement (procedure)| • |HAS INTERPRETATION| |Outside reference range (qualifier value)|

S 4.3.12. PATHOLOGICAL PROCESS

This attribute provides information about the underlying pathological process for a disorder, but only when the results of that process are <u>not structural</u> and <u>cannot be represented by the |ASSOCIATED MORPHOLOGY| attribute</u>.

For the July 2009 release, two new values |Infectious process (qualifier value)| and |Parasitic process (qualifier value)| have been added to the range for | PATHOLOGICAL PROCESS |. These were added to accommodate the change in the *modeling* of *concepts* in the |Infectious disease (disorder)| subhierarchy where the infectious aspect of the disease is now represented using |PATHOLOGICAL PROCESS|.

Table 16: Permissible values for PATHOLOGICAL PROCESS

Attribute Values	Examples
|Autoimmune| 263680009 (==) |Infectious process| 441862004 (<<)	|Autoimmune parathyroiditis (disorder)| • |PATHOLOGICAL PROCESS| |Autoimmune (qualifier value)|
	|Disease caused by parasite (disorder)| • |PATHOLOGICAL PROCESS| |Parasitic process (qualifier value)|

Pathological process must not be used for values that could overlap with |ASSOCIATED MORPHOLOGY|. Inflammatory processes result in inflammation (by definition), but these disorders should be defined using their morphology.

S 4.3.13. HAS DEFINITIONAL MANIFESTATION

This attribute links disorders to the manifestations (observations) that define them. It can only be applied to disorders.

Table 17: Permissible values for HAS DEFINITIONAL MANIFESTATION

Attribute Values	Examples
|Clinical finding| 404684003 (<<)	|Seizure disorder (disorder)| • |HAS DEFINITIONAL MANIFESTATION| |Seizure (finding)|
	|Hypertensive disorder, systemic arterial (disorder)| • |HAS DEFINITIONAL MANIFESTATION| |Finding of increased blood pressure (finding)|

S 4.3.14. OCCURRENCE

This attribute refers to the specific period of life during which a condition first presents. Multiple values of |OCCURRENCE| for a single *concept* are not desirable, and these will be addressed in a future release. This does not mean the condition cannot persist beyond the period of life in which it first presents.

Table 18: Permissible values for OCCURRENCE

Attribute Values	Examples
|Periods of life| 282032007 (<)	|Childhood phobic anxiety disorder (disorder)| • |OCCURRENCE| |Childhood (qualifier value)|

S 4.3.15. FINDING METHOD

This attribute specifies the means by which a clinical finding was determined. This attribute is frequently used in conjunction with |FINDING INFORMER|. Findings that specify that they were determined by examination of the patient (e.g. |On examination - ankle clonus (finding)|) should have a value for both |FINDING METHOD| and | FINDING INFORMER |.

Table 19: Permissible values for FINDING METHOD

Attribute Values	Examples
|Procedure| 71388002 (<=)	|Finding by palpation (finding)| • |FINDING METHOD| |Palpation (procedure)|

S 4.3.16. FINDING INFORMER

This attribute specifies the person or other entity from which the clinical finding information was obtained. This attribute is frequently used in conjunction with |FINDING METHOD|.

Table 20: Permissible values for FINDING INFORMER

Attribute Values	Examples
|Performer of method| 420158005 (<<) |Subject of record or other provider of history| 419358007 (<<)	|Complaining of a headache (finding)| • |FINDING INFORMER| |Subject of record or other provider of history (person)|
	|On examination - ankle clonus (finding)| • |FINDING INFORMER| |Performer of method (person)|

It is accepted that an information model should permit identification of a particular individual who provides information; |FINDING INFORMER| is not about the particular individual. It is about the *category or type* of informer, which is used to differentiate self-reported symptoms from provider-observed signs. Granted, this permits inclusion of epistemology-loaded *terms* (cf. Bodenreider el al., FOIS 2004), but health care is full of such *terms*, and they are (or at least can be) understandable, reproducible and useful.

S 4.4. Attributes used to define Procedure concepts

Table 21: Approved Procedure attributes summary

Defining Attribute	Subsumed Attribute	Allowable Values
|PROCEDURE SITE|		|Anatomical or acquired body structure| 442083009 (<<)
	|Procedure site - Direct|	|Anatomical or acquired body structure| 442083009 (<<)
	|Procedure site - Indirect|	|Anatomical or acquired body structure| 442083009 (<<)
|PROCEDURE MORPHOLOGY|		|Morphologically abnormal structure| 49755003 (<<)
	|Direct morphology|	|Morphologically abnormal structure| 49755003 (<<)
	|Indirect morphology|	|Morphologically abnormal structure| 49755003 (<<)
|METHOD|		|Action| 129264002 (<<)

Defining Attribute	Subsumed Attribute	Allowable Values
|PROCEDURE DEVICE|		|Device| 49062001 (<<)
	|DIRECT DEVICE|	|Device| 49062001 (<<)
	|INDIRECT DEVICE|	|Device| 49062001 (<<)
	|USING DEVICE|	|Device| 49062001 (<<)
	|USING ACCESS DEVICE|	|Device| 49062001 (<<)
|ACCESS|		|Surgical access values| 309795001 (<=)(< Q)
|DIRECT SUBSTANCE|		|Substance| 105590001 (<<) |Pharmaceutical / biologic product| 373873005 (<<)
|PRIORITY|		|Priorities| 272125009 (<=)(< Q)
|HAS FOCUS|		|Clinical finding| 404684003 (<<) |Procedure| 71388002 (<<)
|HAS INTENT|		|Intents (nature of procedure values)| 363675004 (<=)
|RECIPIENT CATEGORY|		|Person| 125676002 (<<) |Family| 35359004 (<<) |Community| 133928008 (<<) |Donor for medical or surgical procedure| 105455006 (<<) |Group| 389109008 (<<)
|REVISION STATUS|		|Primary operation| 261424001 (<<) |Revision - value| 255231005 (<<) |Part of multistage procedure| 257958009 (<<)
|ROUTE OF ADMINISTRATION|		|Route of administration value| 284009009 (<<)
|SURGICAL APPROACH|		|Procedural approach| 103379005 (<=)(< Q)
|USING ENERGY|		|Physical force| 78621006 (<<)
|USING SUBSTANCE|		|Substance| 105590001 (<<)

👉 **Note:**

Meaning of Allowable Values (*Range*) notations:

(<<) this code and descendants,

(<) descendants only,

(<=) descendants only (stated) except for supercategory groupers,

(==) this code only,

(< Q) descendants only when in a qualifying relationship,

(< Q only) descendants only, and only allowed in a qualifying relationship.

👉 **Note:**

Attributes should be grouped with the |METHOD| attribute to which they apply; in the absence of a |METHOD| attribute, attributes that are related to each other should be grouped. The one exception is |RECIPIENT CATEGORY|, because a single procedure code should not be *pre-coordinated* in situations where more than one recipient category is involved. Such complex statements should utilize two or more procedure codes that are placed into an appropriately structured information model.

4.4.1. PROCEDURE SITE

The |PROCEDURE SITE| attribute describes the body site acted on or affected by a procedure. This attribute subsumes, in an attribute *hierarchy* (see *Attribute Hierarchies in SNOMED CT* on page 27), the more specific attributes (|Procedure site - Direct| and |Procedure site - Indirect|) that should be used if possible. The anatomical site may be directly acted on (|Procedure site - Direct|) or indirectly acted upon (|Procedure site - Indirect|).

When *modeling* procedures where the |METHOD| is |Removal - action| or one of its *subtypes* (e.g. | Excision |, | Surgical biopsy |, etc.), removals **of** the structure itself should use |Procedure site - Direct|. Removals of tissue lesions (cysts, tumors, etc.) are considered to be removals of the site, and should also use |Procedure site - Direct|. Removals of devices, calculi, thrombi, foreign bodies and other non-tissue entities **from** the structure should use |Procedure site - Indirect|.

Table 22: Permissible values for PROCEDURE SITE

Attribute Values	Examples
|Anatomical or acquired body structure| 442083009 (<<)	|Procedure on colon (procedure)| • |PROCEDURE SITE| |colon structure (body structure)|

Procedures need not necessarily be categorized by site. |Human body structure| should *not* be assigned as a default value of this attribute because many procedures can be performed on non-human subjects, and because this attribute does *not* necessarily need to be present in a procedure *concept* definition in *order* for *classifier* algorithms to work properly.

The general |PROCEDURE SITE| attribute is used to model the site for high-level grouper type procedure *concepts*. It is most likely to be used for *concepts* that do not require a | METHOD | (action) attribute. Relatively few *concepts* will be modeled using | PROCEDURE SITE |, rather than the more specific direct and indirect site attributes (see below).

4.4.1.1. PROCEDURE SITE DIRECT

This attribute is used when the action of the procedure is directly aimed at an anatomical or acquired body structure or site rather than at something else (such as a device) located there.

Table 23: Permissible values for PROCEDURE SITE DIRECT

Attribute Values	Examples
|Anatomical or acquired body structure| 442083009 (<<)	|Amputation of the foot (procedure)| • |METHOD| |Amputation - action (qualifier value)| • |Procedure site - Direct| |Foot structure (body structure)|
	|Biopsy of femur (procedure)| • |METHOD| |Biopsy - action (qualifier value)| • |Procedure site - Direct| |Bone structure of femur (body structure)|

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4.4.1.1.1. Multiple values for PROCEDURE SITE DIRECT

When the |METHOD| (action) acts directly on a morphological abnormality (more simply, a lesion) arising from, or existing in, the cells of the tissue in which it occurs [e.g. a tumor (including metastatic tumors), granuloma, polyp, or cyst] the attribute |DIRECT MORPHOLOGY| is used to model the morphological abnormality. Most *concept* definitions where | DIRECT MORPHOLOGY | is used, which also require a site in the definition, will use |Procedure site - Direct|. Thus, there can be more than one direct object of the |METHOD| for a *concept*. For example, the | DIRECT MORPHOLOGY | and the |Procedure site - Direct| can both be direct objects of the |METHOD|. An example of an exception to this rule would be removal of a calculus from the ureter. In this case, the calculus is the direct object, but there is no procedure site that is that direct object, since the ureter is an indirect object.

The most common *concepts* that have more than one direct object of the |METHOD| are *Subtypes* of | Removal (procedure) |where the object of the removal (e.g. a neoplasm) can be considered to be a part of the tissue at the anatomical site in which it occurs. When a part of an anatomical structure (however abnormal) has been removed, both the morphological abnormality and the anatomical structure in which it is located are to be modeled as direct objects for the |METHOD| |Removal - action (qualifier value)|. Grafts that become attached via in-growth of capillaries, fibroblasts, and/or other cells or tissues would also be regarded as biologically connected, and therefore *modeling* their removal would include the anatomical structure as a direct object of the action. The anatomical structure is not to be modeled as a direct object of a removal only when the procedure does not necessarily involve removal also of part of the anatomy; examples include removals of things such as a foreign body, a catheter, a renal calculus, or a mechanical implant like a pacemaker.

S

4.4.1.2. PROCEDURE SITE INDIRECT

This attribute describes the anatomical site, which is acted upon, but is not the direct object of the procedure. (The site is indirectly acted on by the procedure.) Usually in these procedures there is another value that is the direct object of the action. Exceptions (*concepts* that do not specify a direct object, but only an indirect object) are usually general groupers such as |Arm implantation (procedure)| (meaning implantation of something into the arm), since the thing implanted could be either a device or a substance (material).

Table 24: Permissible values for PROCEDURE SITE INDIRECT

Attribute Values	Examples
|Anatomical or acquired body structure| 442083009 (<<)	|Removal of catheter from brachial vein (procedure)| • |METHOD| |Removal - action (qualifier value)| • |DIRECT DEVICE| |Catheter, device (physical object)| • |Procedure site - Indirect| |Structure of brachial vein (body structure)|
	|Removal of calculus of urinary bladder (procedure)| • |METHOD| |Removal - action (qualifier value)| • |DIRECT MORPHOLOGY| |Calculus (morphologic abnormality)| • |Procedure site - Indirect| |Urinary bladder structure (body structure)|

S 4.4.2. PROCEDURE MORPHOLOGY

|PROCEDURE MORPHOLOGY| is the attribute used to specify the morphology or abnormal structure involved in a procedure. This attribute subsumes the more specific attributes | DIRECT MORPHOLOGY | and | INDIRECT MORPHOLOGY | that should be used if possible (see below). | DIRECT MORPHOLOGY | is used when the procedure method acts directly on the morphologic abnormality. |INDIRECT MORPHOLOGY| is used when the procedure method acts directly on something else (e.g. a device, substance or anatomical structure) that is associated with the morphologic abnormality. The more general attribute | PROCEDURE MORPHOLOGY | is used when defining general *concepts* that subsume both kinds of sub - *concepts*.

Table 25: Permissible values for PROCEDURE MORPHOLOGY

Attribute Values	Examples
|Morphologically abnormal structure| 49755003 (<<)	

Hematoma , calculus, foreign body, blood clot, embolus, and some other entities are not strictly body structures, but are in the body structure *hierarchy* under morphologically abnormal structure, and are valid values for the |PROCEDURE MORPHOLOGY| attributes.

S 4.4.2.1. DIRECT MORPHOLOGY

This attribute describes the morphologically abnormal structure that is the direct object of the METHOD action.

Table 26: Permissible values for DIRECT MORPHOLOGY

Attribute Values	Examples
|Morphologically abnormal structure| 49755003 (<<)	|Excision of benign neoplasm (procedure)| • |METHOD| |Excision - action (qualifier value)| • |DIRECT MORPHOLOGY| |Neoplasm, benign (morphologic abnormality)|

S

4.4.2.2. INDIRECT MORPHOLOGY

This attribute represents a morphology that is acted upon, but is not the direct target of the action being performed (i.e. the procedure's method acts directly on something else, such as a device, substance, or anatomical structure).

Table 27: Permissible values for INDIRECT MORPHOLOGY

Attribute Values	Examples
|Morphologically abnormal structure| 49755003 (<<)	|Removal of mesh from wound (procedure)| • |METHOD| |Removal - action (qualifier value)| • |DIRECT DEVICE| |Mesh (physical object)| • |INDIRECT MORPHOLOGY| |Wound (morphologic abnormality)|

S ## 4.4.3. METHOD

This attribute represents the action being performed to accomplish the procedure. It does not include the surgical approach (e.g. translumbar), equipment (e.g. sutures), or physical forces (e.g. laser energy).

Table 28: Permissible values for METHOD

Attribute Values	Examples
|Action| 129264002 (<<)	|Incision of ureter (procedure)| • |METHOD| |Incision - action (qualifier value)| • |Procedure site - Direct| |Ureteric structure (body structure)|

The \|METHOD\| can be considered the anchor of each *relationship group* that defines a procedure; if there are two methods, there should be two different *relationship groups*. It is correct to regard each *relationship group* as a kind of sub-procedure that defines the overall procedure. Each method can be regarded as the verb of a sentence, and the verbs direct and indirect objects are specified by the site, morphology, device, substance or energy attributes (below) that are grouped with it.

S ## 4.4.4. PROCEDURE DEVICE

\|PROCEDURE DEVICE\| is a general attribute used to model devices associated with a procedure. It subsumes the more specific attributes \| DIRECT DEVICE \|, \| INDIRECT DEVICE \|, \| USING DEVICE \|, and \| USING ACCESS DEVICE \|, which should be used instead of \|PROCEDURE DEVICE\| if possible. The general attribute \| PROCEDURE DEVICE \| is mainly useful for defining high-level, general *concepts* that aggregate procedures according to the device involved.

Table 29: Permissible values for PROCEDURE DEVICE

Attribute Values	Examples
|Device| 49062001 (<<)	|Catheter procedure (procedure)| • |PROCEDURE DEVICE| |Catheter, device (physical object)|

When the device is the direct object of the action (|METHOD|), the attribute | DIRECT DEVICE | is used. If the action is done indirectly to the device, that is, the action is done to something that is located in or on a device, but is not done directly to the device itself, then the attribute | INDIRECT DEVICE | is used. If the device is used to carry out the action, then the attribute | USING DEVICE | is used. If the device is used to access the site of the action, then the attribute | USING ACCESS DEVICE | is used.

👉 **Note:** The permissible values for attributes in the |PROCEDURE DEVICE| role *hierarchy* include | Device (physical object) | and its *descendants.* However, there are a limited number of products in *SNOMED CT* which are devices that also deliver drugs. These *concepts* descend from | Drug-device combination product (product) | which is a *descendant* of both | Device (physical object) | and |Pharmaceutical / biologic product (product)|. Therefore, although they carry the *hierarchy* tag of (product), they are valid values for attributes in the | PROCEDURE DEVICE | role *hierarchy*.

Example:

|Removal of drug coated stent (procedure)|

- |METHOD| |Catheter, device (physical object)|
- |DIRECT DEVICE| |Drug coated stent (product)|

S

4.4.4.1. DIRECT DEVICE

This attribute represents the device on which the method directly acts.

Table 30: Permissible values for DIRECT DEVICE

Attribute Values	Examples
|Device| 49062001 (<<)	|Removal of arterial stent (procedure)| • |METHOD| |Removal - action (qualifier value)| • |DIRECT DEVICE| |Arterial stent (physical object)|

S

4.4.4.2. INDIRECT DEVICE

This attribute models action done on something that is located in or on a device, but is not done directly on the device itself.

Table 31: Permissible values for INDIRECT DEVICE

Attribute Values	Examples
|Device| 49062001 (<<)	|Excision of vegetations from implanted mitral valve (procedure)| • |METHOD| |Excision - action (qualifier value)| • |DIRECT MORPHOLOGY| |Vegetation (morphologic abnormality)| • |INDIRECT DEVICE| |Mitral valve prosthesis, device (physical object)| • |Procedure site - Indirect| |Mitral valve structure (body structure)|

> **Note:**
>
> In the above example, the vegetation is being excised. The mitral valve prosthesis is where the excised vegetation is located but the mitral valve prosthesis itself is not excised. Thus, mitral valve prosthesis is the |INDIRECT DEVICE|.

> **Note:**
>
> The attribute |INDIRECT DEVICE| is infrequently needed. When using this attribute, a second look is advisable to be sure it is needed.

4.4.4.3. USING DEVICE

This attribute refers to the instrument or equipment utilized to execute an action. |USING DEVICE| is used when the device is actually used to carry out the action that is the focus of the procedure. If the device is simply the means to access the site of the procedure, then |USING ACCESS DEVICE| is used instead of | USING DEVICE |.

Table 32: Permissible values for USING DEVICE

Attribute Values	Examples
|Device| 49062001 (<<)	|Core needle biopsy of larynx (procedure)| • |METHOD| |Biopsy - action (qualifier value)| • |USING DEVICE| |Core biopsy needle, device (physical object)| • |Procedure site - Direct| |Laryngeal structure (body structure)|

4.4.4.4. USING ACCESS DEVICE

This attribute specifies the instrument or equipment used to access the site of a procedure.

Table 33: Permissible values for USING ACCESS DEVICE

Attribute Values	Examples
|Device| 49062001 (<<)	|Arthroscopic synovial biopsy (procedure)| • |METHOD| |Biopsy - action (qualifier value)| • |USING ACCESS DEVICE| |Arthroscope, device (physical object)| • |Procedure site - Direct| |Structure of synovial tissue of joint (body structure)|

4.4.5. ACCESS

This attribute describes the route used to access the site of a procedure. It is used to distinguish open, closed, and percutaneous procedures.

Table 34: Permissible values for ACCESS

Attribute Values	**Examples**
|Surgical access values| 309795001 (<=)(< Q)	|Open removal of bile duct stent (procedure)| • |ACCESS| |Open approach - access (qualifier value)|

S 4.4.6. DIRECT SUBSTANCE

This attribute describes the \|Substance\| or \|Pharmaceutical / biologic product\| on which the procedure's method directly acts.

Table 35: Permissible values for DIRECT SUBSTANCE

Attribute Values	**Examples**
|Substance| 105590001 (<<) |Pharmaceutical / biologic product| 373873005 (<<)	|Injection of prostaglandin (procedure)| • |METHOD| |Injection - action (qualifier value)| • |DIRECT SUBSTANCE| *|Prostaglandin (substance)|*

> **Note:** As an editorial policy, in the distribution form of the International Release, \|Pharmaceutical / biologic product (product)\| and its *descendants* are not used as values for \| DIRECT SUBSTANCE \|.

S 4.4.7. PRIORITY

This attribute refers to the priority assigned to a procedure.

Table 36: Permissible values for PRIORITY

Attribute Values	**Examples**
|Priorities| 272125009 (<=)(< Q)	|Emergency cesarean section (procedure)| • |PRIORITY| |Emergency (qualifier value)|

S 4.4.8. HAS FOCUS

This attribute specifies the \|Clinical finding\| or \|Procedure\| which is the focus of a procedure.

Table 37: Permissible values for HAS FOCUS

Attribute Values	**Examples**
|Clinical finding| 404684003 (<<) |Procedure| 71388002 (<<)	|Cardiac rehabilitation assessment (procedure)| • |HAS FOCUS| |Cardiac rehabilitation (regime/therapy)|

S 4.4.9. HAS INTENT

This attribute specifies the intent of a procedure.

Table 38: Permissible values for HAS INTENT

Attribute Values	Examples
|Intents (nature of procedure values)| 363675004 (<=)	|Diagnostic bronchoscopy (procedure)| • |HAS INTENT| |Diagnostic intent (qualifier value)|

S 4.4.10. RECIPIENT CATEGORY

This attribute specifies the type of individual or group upon which the action of the procedure is performed. For example, it can be used in blood banking procedures to differentiate whether the procedure was performed on the donor or the recipient of a blood product. In other words, |RECIPIENT CATEGORY| is |Donor for medical or surgical procedure (person)| if the subject of the record is the donor.

It is not used for a procedure where the subject of the procedure is someone other than the subject of record.

Table 39: Permissible values for RECIPIENT CATEGORY

Attribute Values	Examples
|Person| 125676002 (<<) |Family| 35359004 (<<) |Community| 133928008 (<<) |Donor for medical or surgical procedure| 105455006 (<<) |Group| 389109008 (<<)	|Social service interview of family (procedure)| • |RECIPIENT CATEGORY| |Family (social concept)|

S 4.4.11. REVISION STATUS

This attribute specifies whether a procedure is primary or a revision.

Table 40: Permissible values for REVISION STATUS

Attribute Values	Examples
|Primary operation| 261424001 (<<) |Revision - value| 255231005 (<<) |Part of multistage procedure| 257958009 (<<)	|Primary repair of inguinal hernia (procedure)| • |REVISION STATUS| |Primary operation (qualifier value)|
	|Revision of knee arthroplasty (procedure)| • |REVISION STATUS| |Revision - value (qualifier value)|

S 4.4.12. ROUTE OF ADMINISTRATION

This attribute allows representation of the route by which a procedure introduces a given substance into the body.

The domain for this attribute is the sub - *hierarchy* below |Administration of substance via specific route (procedure)| 433590000.

Table 41: Permissible values for ROUTE OF ADMINISTRATION

Attribute Values	Examples
|Route of administration value| 284009009 (<<)	|Inhaled drug administration (procedure)| • |ROUTE OF ADMINISTRATION| |By inhalation (route) (qualifier value)|

S 4.4.13. SURGICAL APPROACH

This attribute specifies the directional, relational, or spatial access to the site of a surgical procedure. The domain for |SURGICAL APPROACH| is *descendants* of | Surgical procedure (procedure) | 387713003.

Table 42: Permissible values for SURGICAL APPROACH

Attribute Values	Examples
|Procedural approach| 103379005 (<=)(< Q)	|Intranasal ethmoidectomy (procedure)| • |SURGICAL APPROACH| |Intranasal approach (qualifier value)|
	|Abdominal hysterectomy (procedure)| • |SURGICAL APPROACH| |Abdominal approach (qualifier value)|

S 4.4.14. USING SUBSTANCE

This attribute describes the |Substance| used to execute the action of a procedure, but it is not the substance on which the procedure's method directly acts (the |DIRECT SUBSTANCE|).

Table 43: Permissible values for USING SUBSTANCE

Attribute Values	Examples
|Substance| 105590001 (<<)	|Contrast radiography of esophagus (procedure)| • |METHOD| |Radiographic imaging - action (qualifier value)| • |Procedure site - Direct| |Esophageal structure (body structure)| • |USING SUBSTANCE| |Contrast media (substance)|

S 4.4.15. USING ENERGY

This attribute describes the energy used to execute an action. |USING ENERGY| has been introduced because the new attribute | USING DEVICE | is now used only to represent the instrument or equipment used to execute the action. Unlike the attribute USING, which it replaces, | USING DEVICE | does not take values from the | physical force | *hierarchy*.

Table 44: Permissible values for USING ENERGY

Attribute Values	Examples
|Physical force| 78621006 (<<)	|Gamma ray therapy (procedure)| • |USING ENERGY| |Gamma radiation (physical force)|

S 4.4.16. Direct and indirect objects

Procedures that have a |METHOD| *attribute* can be described using an action verb that corresponds to the method. The direct object(s) of the action verb should be represented using (at least) one of the four direct object *attributes* , depending on whether the direct object on which the method acts is a device (| DIRECT DEVICE |), anatomical structure (|Procedure site - Direct|), morphologic abnormality (| DIRECT MORPHOLOGY |) or substance (| DIRECT SUBSTANCE |).

When the type (body structure, device, or substance) of direct object is indeterminate, the direct-object *attributes* should not be used.

S 4.5. Attributes used to define Evaluation Procedure concepts

Table 45: Approved Evaluation Procedure attributes summary

Defining Attribute	Allowable Values
|HAS SPECIMEN|	|Specimen| 123038009 (<=)(< Q)
|COMPONENT|	|Substance| 105590001 (<=)(< Q) |Observable entity| 363787002 (<=)(< Q) |Cell structure| 4421005 (<=)(< Q) |Organism| 410607006 (<=)(< Q)
|TIME ASPECT|	|Time frame| 7389001 (<=)(< Q)
|PROPERTY|	|Property of measurement| 118598001 (<=)(< Q)

Defining Attribute	Allowable Values
|SCALE TYPE|	|Quantitative| 30766002 (<<)
	|Qualitative| 26716007 (<<)
	|Ordinal value| 117363000 (<<)
	|Ordinal or quantitative value| 117365007 (<<)
	|Nominal value| 117362005 (<<)
	|Narrative value| 117364006 (<<)
	|Text value| 117444000 (<<)
|MEASUREMENT METHOD|	|Laboratory procedure categorized by method| 127789004(<=)

👉 **Note:**

Meaning of Allowable Values (*Range*) notations:

(<<) this code and descendants,
(<) descendants only,
(<=) descendants only (stated) except for supercategory groupers,
(==) this code only,
(< Q) descendants only when in a qualifying relationship,
(< Q only) descendants only, and only allowed in a qualifying relationship.

S 4.5.1. HAS SPECIMEN

This attribute specifies the type of specimen on which a measurement or observation is performed.

Table 46: Permissible values for HAS SPECIMEN

Attribute Values	
|Specimen| 123038009 (<=)(< Q)	

S 4.5.2. COMPONENT

This attribute refers to what is being observed or measured by a procedure.

Table 47: Permissible values for COMPONENT

Attribute Values	Example
|Substance| 105590001 (<=)(< Q) |Observable entity| 363787002 (<=)(< Q) |Cell structure| 4421005 (<=)(< Q) |Organism| 410607006 (<=)(< Q)	|Protein measurement (procedure)| • |COMPONENT| |Protein (substance)|

S 4.5.3. TIME ASPECT

This attribute specifies temporal *relationships* for a measurement procedure.

Table 48: Permissible values for TIME ASPECT

Attribute Values	
|Time frame| 7389001 (<=)(< Q)	

S 4.5.4. PROPERTY

This attribute specifies the kind of property being measured (e.g. concentration).

Table 49: Permissible values for PROPERTY

Attribute Values	
|Property of measurement| 118598001 (<=)(< Q)	

S 4.5.5. SCALE TYPE

This attribute refers to the scale of the result of an observation of a diagnostic test (i.e. quantitative, qualitative, semi-quantitative).

Table 50: Permissible values for SCALE TYPE

Attribute Values	
|Quantitative| 30766002 (<<)	
|Qualitative| 26716007 (<<)	
|Ordinal value| 117363000 (<<)	
|Ordinal or quantitative value| 117365007 (<<)	
|Nominal value| 117362005 (<<)	
|Narrative value| 117364006 (<<)	
|Text value| 117444000 (<<)	

S 4.5.6. MEASUREMENT METHOD

This attribute specifies the method by which a procedure is performed.

Table 51: Permissible values for MEASUREMENT METHOD

Attribute Values	
|Laboratory procedure categorized by method| 127789004(<=)	

For measurement procedures, the attribute |METHOD| is given the value |Measurement - action (qualifier value)|. The attribute | MEASUREMENT METHOD | can be used to provide additional specificity.

S 4.6. Attributes used to define Specimen concepts

Table 52: Approved Specimen attributes summary

Defining Attribute	Allowable Values
|SPECIMEN PROCEDURE|	|Procedure| 71388002 (<)
|SPECIMEN SOURCE TOPOGRAPHY|	|Anatomical or acquired body structure| 442083009 (<<)
|SPECIMEN SOURCE MORPHOLOGY|	|Morphologically abnormal structure| 49755003 (<<)
|SPECIMEN SUBSTANCE|	|Substance| 105590001 (<<)
|SPECIMEN SOURCE IDENTITY|	|Person| 125676002 (<<) |Family| 35359004 (<<) |Community| 133928008 (<<) |Device| 49062001 (<<) |Environment| 276339004 (<<)

👉 **Note:**

Meaning of Allowable Values (*Range*) notations:

(<<) this code and descendants,
(<) descendants only,
(<=) descendants only (stated) except for supercategory groupers,
(==) this code only,
(< Q) descendants only when in a qualifying relationship,
(< Q only) descendants only, and only allowed in a qualifying relationship.

S 4.6.1. SPECIMEN PROCEDURE

This attribute identifies the procedure by which a specimen is obtained.

Table 53: Permissible values for SPECIMEN PROCEDURE

Attribute Values	Examples
|Procedure| 71388002 (<)	|Urine specimen obtained by clean catch procedure (specimen)| • |SPECIMEN PROCEDURE| |Urine specimen collection, clean catch (procedure)|
	|Specimen from stomach obtained by total gastrectomy (specimen)| • |SPECIMEN PROCEDURE| |Total gastrectomy (procedure)|

4.6.2. SPECIMEN SOURCE TOPOGRAPHY

This attribute specifies the body site from which a specimen is obtained.

Table 54: Permissible values for SPECIMEN SOURCE TOPOGRAPHY

Attribute Values	Examples
|Anatomical or acquired body structure| 442083009 (<<)	|Cervix cytologic material (specimen)| • |SPECIMEN SOURCE TOPOGRAPHY| |Cervix uteri structure (body structure)|
	|Omentum biopsy sample (specimen)| • |SPECIMEN SOURCE TOPOGRAPHY| |Omentum structure (body structure)|

4.6.3. SPECIMEN SOURCE MORPHOLOGY

This *attribute names* the morphologic abnormality from which a specimen is obtained.

Table 55: Permissible values for SPECIMEN SOURCE MORPHOLOGY

Attribute Values	Examples
|Morphologically abnormal structure| 49755003 (<<)	|Specimen from cyst (specimen)| • |SPECIMEN SOURCE MORPHOLOGY| |Cyst (morphologic abnormality)|
	|Specimen from wound abscess (specimen)| • |SPECIMEN SOURCE MORPHOLOGY| |Abscess of wound (morphologic abnormality)|

S 4.6.4. SPECIMEN SUBSTANCE

This *attribute names* the type of substance of which a specimen is comprised.

Table 56: Permissible values for SPECIMEN SUBSTANCE

Attribute Values	**Examples**
|Substance| 105590001 (<<)	|Mid-stream urine sample (specimen)| • |SPECIMEN SUBSTANCE| |Urine (substance)|
	|Pancreatic fluid specimen (specimen)| • |SPECIMEN SUBSTANCE| |Pancreatic fluid (substance)|

S 4.6.5. SPECIMEN SOURCE IDENTITY

This *attribute names* the type of individual, group, or physical location from which a specimen is collected.

Table 57: Permissible values for SPECIMEN SOURCE IDENTITY

Attribute Values	**Examples**
|Person| 125676002 (<<) |Family| 35359004 (<<) |Community| 133928008 (<<) |Device| 49062001 (<<) |Environment| 276339004 (<<)	|Blood specimen from blood donor (specimen)| • |SPECIMEN SOURCE IDENTITY| |Blood donor (person)|
	|Catheter tip specimen (specimen)| • |SPECIMEN SOURCE IDENTITY| |Catheter tip, device (physical object)|

S 4.7. Attributes used to define Body structure concepts

Just one attribute is used in Anatomy, namely, Laterality. This attribute is detailed below.

Table 58: Attributes for Body structure concepts summary table

Defining *Attribute*	**Permissible Values**
|LATERALITY|	|Side| 182353008 (<=)

👉 **Note:**

Permissible values for this attribute include the *descendants* of the *concept* listed, except for super category grouper *concepts*.

4.7.1. LATERALITY

This attribute provides information on whether a body structure is left, right, bilateral or unilateral. It is applied only to bilaterally symmetrical body structures which exist on opposite sides of the body.

Table 59: Permissible values for LATERALITY

Attribute Values	Examples
|Side| 182353008 (<=)		Left kidney structure (body structure)	 •	LATERALITY		Left (qualifier value)	

4.8. Attributes used to define Pharmaceutical/Biologic Product concepts

Table 60: Approved Pharmaceutical/Biologic Product attributes summary

Defining Attribute	Allowable Values
|HAS ACTIVE INGREDIENT|	|Substance| 105590001 (<<)
|HAS DOSE FORM|	|Type of drug preparation| 105904009 (<<)

👉 **Note:**

Permissible values for these attributes include the *concepts* listed and their *descendants*.

4.8.1. HAS ACTIVE INGREDIENT

This attribute indicates the *active* ingredient of a drug product, linking the |Pharmaceutical / biologic product| *hierarchy* to the | Substance | *hierarchy*.

Table 61: Permissible values for HAS ACTIVE INGREDIENT

Attribute Values	Examples
|Substance| 105590001 (<<)	|Naproxen 500mg tablet (product)| • |HAS ACTIVE INGREDIENT| |Naproxen (substance)|

S 4.8.2. HAS DOSE FORM

This attribute specifies the dose form of a product.

Table 62: Permissible values for HAS DOSE FORM

Attribute Values	Examples
|Type of drug preparation| 105904009 (<<)	|Digoxin 0.1mg capsule (product)| • |HAS DOSE FORM| |Oral capsule (qualifier value)|

S 4.9. Attributes used to define Situation with Explicit Context concepts

Table 63: Approved Situation attributes summary

Defining Attribute	Allowable Values
|ASSOCIATED FINDING|	|Clinical finding| 404684003 (<=)(< Q) |Event| 272379006 (<=)(< Q) |Observable entity| 363787002 (< Q only) |Link assertion| 416698001 (< Q only) |Procedure| 71388002 (< Q only)
|FINDING CONTEXT|	|Finding context value| 410514004 (<=)(< Q)
|ASSOCIATED PROCEDURE|	|Procedure| 71388002 (<=)(< Q) |Observable entity| 363787002 (< Q only)
|PROCEDURE CONTEXT|	|Context values for actions| 288532009 (<=)(< Q)
|TEMPORAL CONTEXT|	|Temporal context value| 410510008 (<=)(< Q)
|SUBJECT RELATIONSHIP CONTEXT|	|Person| 125676002 (<=)(< Q)

👉 **Note:**

Meaning of Allowable Values (*Range*) notations:

(<<) this code and descendants,

(<) descendants only,

(<=) descendants only (stated) except for supercategory groupers,

(==) this code only,

(< Q) descendants only when in a qualifying relationship,

(< Q only) descendants only, and only allowed in a qualifying relationship.

S 4.9.1. Context

The meaning conveyed by a *SNOMED CT* code in a medical record is affected by the context in which it is recorded. For instance, the code for "breast cancer" might be used to indicate a family history of breast cancer, a past history of breast cancer, or a *current* diagnosis of breast cancer. Each of these three meanings differs in regard to the context in which breast cancer is being described. Family history of breast cancer refers to breast cancer occurring in a family member of a patient. Past history of breast cancer indicates that the breast cancer occurred in the patient, at some *time* in the past, and it is not necessarily present now. *Current* diagnosis of breast cancer indicates that the breast cancer is present now, and in this patient. These differences are important for data retrieval, because it would be incorrect when searching for patients with breast cancer to retrieve those who merely have a family history of breast cancer.

S 4.9.2. Default Context

When a *SNOMED CT* code appears in a record without any explicitly stated context, that code is considered to have a default context. The default is "soft" in that it can be over-ridden by information carried in the structure of the record or its information model.

The default context for a clinical finding code implies that the finding has actually occurred (vs. being absent), that it applies to the subject of the record (the patient), and that it is occurring currently or occurred at a past *time* that is given by a date - *time* record linked to the code.

The default context for a procedure code implies that the procedure was completed, that it was performed on the subject of the record (the patient), and that it was done at the present *time* or in the past at a *time* that is given by a date - *time* record linked to the code.

S 4.9.3. Axis Modifiers

The six attributes used to define situation codes permit explicit (rather than default) representation of various contexts. These attributes can change the meaning of a clinical finding or procedure code in a way that changes the *hierarchy* (or "axis") of the code from |Clinical finding| or | Procedure | to | Situation with explicit context |. The resulting modified meaning is not a *subtype* of the original meaning of the code, and therefore the axis-modifying attributes are not used to qualify the code, but instead are used to qualify a "situation" code.

For instance, if |Fine needle biopsy (procedure)| is given the non-context modifying attribute |Procedure site - Direct| and a value of |Urinary bladder structure (body structure)|, the resulting *concept* | Fine needle biopsy of urinary bladder (procedure) | is still a *subtype* of the original *concept* | Fine needle biopsy (procedure) |.

However, the *concept* |Urine protein test not done (situation)| uses the context-modifying attribute | PROCEDURE CONTEXT | and a value of | Not done (qualifier value) |, and the resulting *concept* is not a *subtype* of | Urine protein test (procedure) |. Its axis (*hierarchy*) has been modified.

S 4.9.4. Overview of context attributes

Of the six attributes applied to *concepts* in the |Situation with explicit context| *hierarchy*, two are used only in representing the context in which a | Clinical finding | is recorded, (| ASSOCIATED FINDING | and | FINDING CONTEXT |); two are used only in representing the context in which a |Procedure| is recorded (| ASSOCIATED PROCEDURE | and |PROCEDURE CONTEXT|); and two attributes are used in representing the context of both |Procedure| and |Clinical finding| (| SUBJECT RELATIONSHIP CONTEXT | and | TEMPORAL CONTEXT |).

S 4.9.5. ASSOCIATED FINDING

This attribute links *concepts* in the |Situation with explicit context| *hierarchy* to their related | Clinical finding |. It specifies the | Clinical finding | *concept* whose context is being modified.

Table 64: Permissible values for ASSOCIATED FINDING

Attribute Values	**Examples**
|Clinical finding| 404684003 (<=)(< Q) |Event| 272379006 (<=)(< Q) |Observable entity| 363787002 (< Q only) |Link assertion| 416698001 (< Q only) |Procedure| 71388002 (< Q only)	|Family history of stroke (situation)| • |ASSOCIATED FINDING| |Cerebrovascular accident (disorder)|

☞ **Note:**

When |ASSOCIATED FINDING| is used in *post-coordinated expressions*, its range is broader than when used in distributed content.

|ASSOCIATED FINDING| must not reference *concepts* that already have *pre-coordinated* context themselves.

For example, the following definition uses |FH: Thyroid disorder| incorrectly:

|History of thyroid disease in father|:

• |SUBJECT RELATIONSHIP CONTEXT|=| father |
• |ASSOCIATED FINDING|=|FH: Thyroid disorder|.

The following is the correct definition:

|History of thyroid disease in father|:

• |SUBJECT RELATIONSHIP CONTEXT|=| father |
• |ASSOCIATED FINDING|=| thyroid disease |.

S 4.9.6. FINDING CONTEXT

The FINDING CONTEXT attribute is used to represent a situation in which a *Clinical finding* is known or unknown, and if known, whether it is present, absent, or uncertain (possible); and also to express the meaning that the finding is not actual but instead an anticipated or possible future finding.

Table 65: Permissible values for FINDING CONTEXT

Attribute Values	**Examples**
|Finding context value| 410514004 (<=)(< Q)	|No cough (situation)| • |ASSOCIATED FINDING| |Cough (finding)| • |FINDING CONTEXT| |Known absent (qualifier value)|

S 4.9.7. ASSOCIATED PROCEDURE

This attribute links *concepts* in the |Situation with explicit context| *hierarchy* to *concepts* in the | Procedure | *hierarchy* for which there is additional specified context.

Table 66: Permissible values for ASSOCIATED PROCEDURE

Attribute Values	Examples
|Procedure| 71388002 (<=)(< Q) |Observable entity| 363787002 (< Q only)	|Operative procedure planned (situation)| • |ASSOCIATED PROCEDURE| |Surgical procedure (procedure)|

S 4.9.8. PROCEDURE CONTEXT

This attribute indicates the degree of completion, or *status*, of a |Procedure|, as well as its various possible future states prior to its being initiated or completed.

Table 67: Permissible values for PROCEDURE CONTEXT

Attribute Values	Examples
|Context values for actions| 288532009 (<=)(< Q)	|Operative procedure planned (situation)| • |ASSOCIATED PROCEDURE| |Surgical procedure (procedure)| • |PROCEDURE CONTEXT| |Planned (qualifier value)|

S 4.9.9. TEMPORAL CONTEXT

This attribute indicates the *time* of occurrence of the situation, indicating whether the procedure or finding that it represents is actual and therefore occurred in the present, in the past, or at a specified *time*; or that it is planned or expected, that is, temporally located in the future. The most general value is simply |Current or past (actual)|, meaning that the *concept* was actual (not planned or expected), but not specifying anything further about its *time*. The word "specified" in the | TEMPORAL CONTEXT | values means that there is a date - *time* stamp associated with the code in the record, that gives a date and/or *time*, as a point and/or interval, that applies to the *concept*.

Table 68: Permissible values for TEMPORAL CONTEXT

Attribute Values	Examples
|Temporal context value| 410510008 (<=)(< Q)	|History of - hematuria (situation)| • |ASSOCIATED FINDING| |Blood in urine (finding)| • |TEMPORAL CONTEXT| |In the past (qualifier value)|

S 4.9.10. SUBJECT RELATIONSHIP CONTEXT

This attribute is used to specify the subject of the |Clinical finding| or | Procedure | being recorded, in relation to the subject of the record. In the example below, the subject of the record is the patient and the subject who smokes is the patient's father.

Table 69: Permissible values for SUBJECT RELATIONSHIP CONTEXT

Concept Values	Examples
|Person| 125676002 (<=)(< Q)	|Father smokes (situation)| • |ASSOCIATED FINDING| |Smoker (finding)| • |SUBJECT RELATIONSHIP CONTEXT| |Father of subject (person)|

S 4.10. Attributes used to define Event concepts

Table 70: Approved Event attributes summary

Defining Attribute	Subsumed Attribute	Allowable Values
|ASSOCIATED WITH|		|Clinical Finding| 404684003 (<<)
		|Procedure| 71388002 (<<)
		|Event| 272379006 (<<)
		|Organism| 410607006 (<<)
		|Substance| 105590001 (<<)
		|Physical object| 260787004 (<<)
		|Physical force| 78621006 (<<)
		|Pharmaceutical / biologic product| 373873005 (<< Q only)
		|SNOMED CT Concept| 138875005 (==)
	|CAUSATIVE AGENT|	|Organism| 410607006 (<<)
		|Substance| 105590001 (<<)
		|Physical object| 260787004 (<<)
		|Physical force| 78621006 (<<)
		|Pharmaceutical / biologic product| 373873005 (<< Q only)
		|SNOMED CT Concept| 138875005 (==)
	|DUE TO|	|Clinical Finding| 404684003 (<=)
		|Event| 272379006 (<=)
	|AFTER|	|Clinical Finding| 404684003 (<<)
		|Procedure| 71388002 (<<)
|OCCURRENCE|		|Periods of life| 282032007 (<)

👉 **Note:**

Meaning of Allowable Values (*Range*) notations:

(<<) this code and descendants,
(<) descendants only,
(<=) descendants only (stated) except for supercategory groupers,
(==) this code only,
(< Q) descendants only when in a qualifying relationship,
(< Q only) descendants only, and only allowed in a qualifying relationship.

For guidance and examples on the use of these attributes and value ranges to define events, see the section on clinical findings.

S 4.11. Attributes used to define Physical Object concepts

Table 71: Approved Physical Object attributes summary

Defining Attribute	Allowable Values
|HAS ACTIVE INGREDIENT|	|Substance| 105590001 (<<)

👉 **Note:**

Allowable values for this attribute includes the *concept* listed and its *descendants*.

A limited number of *concepts* (e.g. drug-eluting stents) reside in the *Pharmaceutical/biologic product hierarchy* and the *Physical object hierarchy*. These *concepts* are all under |Drug-device combination product (product)|. This is the domain of |HAS ACTIVE INGREDIENT| within the *Physical Object hierarchy*. Editorial policies for the use of other attributes in the *Physical object hierarchy* generally, outside this particular domain, have yet to be established.

S 4.12. Relationship Groups in SNOMED CT

Multiple attributes and their values can be grouped together into "*Relationship groups*" to add clarity to *concept* definitions. A *Relationship group* combines an *attribute-value pair* with one or more other *attribute-value pairs*. *Relationship groups* originated to add clarity to | Clinical finding | *concepts* which require multiple | ASSOCIATED MORPHOLOGY | attributes and multiple | FINDING SITE | attributes and to |Procedure| which require multiple | METHOD | attributes and multiple | PROCEDURE SITE | attributes. However, *Relationship groups* are not limited to | Clinical finding | and | Procedure | *concepts.*

In the case of | Procedure |, *Relationship groups* generally associate the correct method with the correct site. In the example below, the *Relationship groups* clarify that there is exploration of the bile duct, and excision of the gall bladder. Without *Relationship groups*, the four attributes would be ungrouped and it would be unclear whether the excision was of the bile duct or of the gall bladder.
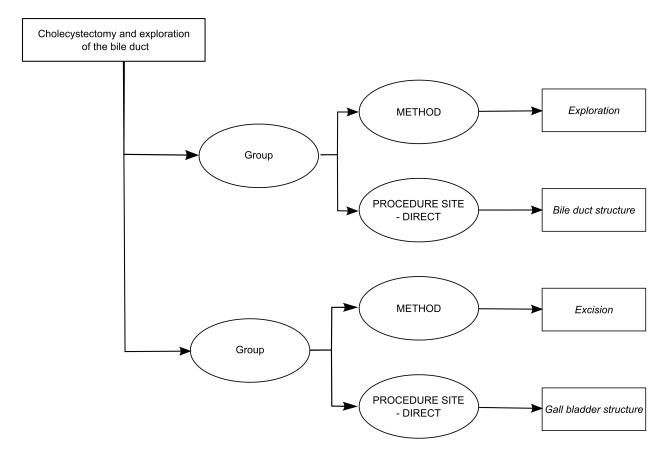
Figure 9: Example Cholecystectomy and exploration of bile duct

Chapter

5

Hierarchies

Topics:

S

SNOMED CT concepts are organized into hierarchies. There are two special Codes referred to as the | Root Concept Code | and the | Root Metadata Code |. They are at the "root" of the two hierarchies that contain all *Concept* Codes in *SNOMED CT*. The root named "*SNOMED CT Concept*" subsumes (is the supertype of) the top-level *concepts* and all the *concepts* beneath them (their *subtypes*), and the root named "*SNOMED CT* Model *component*" subsumes all the metadata components. As the hierarchies are descended, the *concepts* within them become increasingly specific (or granular). A brief description of the content in each *hierarchy* is given below.

👉 **Note:** The | Root Metadata Code | and the *hierarchy* under it have been included in a technology preview release, but have been omitted from the official January 2010 *International Release* of *SNOMED CT*. The technology preview provides *SNOMED CT* in a new release format, called *Release Format 2* (*RF2*), as a draft for trial use.

Subtype (or "*child*") *concepts* are the *descendant concepts* of Supertype (or "parent") *concepts*.

👉 **Example:** | Streptococcal arthritis (disorder) | is a *subtype* of | Bacterial arthritis (disorder) |.

Supertype *concepts* are the *ancestor concepts* of *Subtype* concepts.

👉 **Example:** | Bacterial arthritis (disorder) | is a supertype of | Streptococcal arthritis (disorder) |.

𝒮 5.1. Summary of Top Level Hierarchies

𝒮 5.1.1. Top Level Concepts

Table 72: Top Level Concepts

• | Clinical finding |	• | Physical force |
• | Procedure |	• | Event |
• | Observable entity |	• | Environment or geographical location |
• | Body structure |	• | Social context |
• | Organism |	• | Situation with explicit context |
• | Substance |	• | Staging and scales |
• | Pharmaceutical / biologic product |	• | Physical object |
• | Specimen |	• | Qualifier value |
• | Special concept |	• | Record artifact |
• | Linkage concept |	

𝒮 5.1.2. Top Level Metadata

Table 73: Top Level Metadata

• | Core metadata concept |
• | Foundation metadata concept |

𝒮 5.2. Clinical finding

Concepts in this *hierarchy* represent the result of a clinical observation, assessment or judgment , and include both normal and abnormal clinical states.

Examples of Clinical finding concepts:

-   \| Clear sputum (finding) \| ;
-   \| Normal breath sounds (finding) \| ;
-   \| Poor posture (finding) \| .

The \| Clinical finding \| *hierarchy* contains the sub - *hierarchy* of \| Disease \|. *Concepts* that are *descendants* of \| Disease \| (or disorders) are always and necessarily abnormal clinical states. Multi-axial *subtype* hierarchies allow diseases to be *subtypes* of other disorders as well as *subtypes* of findings.

Examples of Disease concepts:

-   \| Tuberculosis (disorder) \| ;
-   \| non-Hodgkin's lymphoma (disorder) \| .

S 5.3. Procedure

| Procedure | *concepts* represent activities performed in the provision of health care. This *hierarchy* represents a broad variety of activities, including but not limited to, invasive procedures (e.g. | Excision of intracranial artery (procedure) |), administration of medicines (e.g. | Pertussis vaccination (procedure) |), imaging procedures (e.g. | Ultrasonography of breast (procedure) |), education procedures (e.g. | Low salt diet education (procedure) |), and administrative procedures (e.g. | Medical records transfer (procedure) |).

Examples of Procedure concepts:

- | Removal of urethral catheter (procedure) | ;
- | Intravenous steroid injection (procedure) | ;
- | Irrigation of oral wound (procedure) | ;
- | Appendectomy (procedure) | .

S 5.4. Situation with explicit context

Concepts in the | Procedure | and |Clinical finding| hierarchies (given the appropriate record structure) can be used in a clinical record to represent:

- Conditions and procedures that have not yet occurred (e.g. | Endoscopy arranged (situation) |);
- Conditions and procedures that refer to someone other than the patient (e.g. | Family history: Diabetes mellitus (situation) |, | Discussed with next of kin (situation) |);
- Conditions and procedures that have occurred at some time prior to the time of the *current* entry in the record (e.g. | History of - aortic aneurysm (situation) |, |History of - splenectomy (situation)|).

In each of these examples, clinical context is specified. The second example, in which someone other than the patient is the focus of the *concept*, could be represented in an application or record structure by combining a header *term* Family history with the value Diabetes. The specific context (in this case, family history) would be represented using the record structure. In this case, the *pre-coordinated* context-dependent *concept* | Family history: Diabetes mellitus (situation) | would not be used because the information model has already captured the family history aspect of the diabetes.

Concepts in the | Procedure | and |Clinical finding| *hierarchy* have a default context of the following:

- The procedure **has actually occurred**(versus being planned or canceled) or the finding is actually present (versus being ruled out, or considered);
- The procedure or finding being recorded **refers to the patient of record** (versus, for example, a family member);
- The procedure or finding **is occurring now or at a specified *time*** (versus some time in the past).

In addition to using the record structure to represent context, there is sometimes a need to override these defaults and specify a particular context using the formal logic of the terminology. For that *reason*, *SNOMED CT* has developed a context model to allow users and/or implementers to specify context using the terminology, without depending on a particular record structure. The | Situation with explicit context | *hierarchy* and various attributes assigned to *concepts* in this *hierarchy* accomplish this.

Examples of Situation with explicit context concepts:

- | Family history: Myocardial infarction (situation) | ;
- | No family history of stroke (situation) | ;
- | Nasal discharge present (situation) | ;
- | Suspected epilepsy (situation) | .

S 5.5. Observable entity

Concepts in this *hierarchy* can be thought of as representing a question or procedure which can produce an answer or a result. For instance, | Left ventricular end-diastolic pressure (observable entity) | could be interpreted as the question, "What is the left ventricular end diastolic pressure?" or "What is the measured left ventricular end-diastolic pressure?"

Observables are entities that could be used to code elements on a checklist or any element where a value can be assigned. | Color of nail (observable entity) | is an observable. | Gray nails (finding) | is a finding.

One use for | Observable entity | in a clinical record is to code headers on a template. For example, | Gender (observable entity) | could be used to code a section of a template titled "Gender" where the user would choose "male" or "female". "Female gender" would then constitute a finding.

S 5.6. Body structure

| Body structure | *concepts* include normal as well as abnormal anatomical structures. Normal anatomical structures can be used to specify the body site involved by a disease or procedure.

Examples of Body structure concepts:

- | Mitral valve structure (body structure) | ;
- | Uterine structure (body structure) | .

Morphologic alterations from normal body structures are represented in the sub - *hierarchy* | Body structure, altered from its original anatomical structure (morphologic abnormality) |.

Examples of Body Structure, altered from its original anatomical structure concepts:

- | Adenosarcoma (morphologic abnormality) | ;
- | Polyp (morphologic abnormality) | .

S 5.7. Organism

This *hierarchy* includes organisms of significance in human and animal medicine. Organisms are also used in *modeling* the causes of diseases in *SNOMED CT*. They are important for public health reporting of the causes of notifiable conditions and for use in evidence-based infectious disease protocols in clinical decision support systems. Sub-hierarchies of organism include, but are not limited to: | Animal (organism) |, | Microorganism (organism) |, | Kingdom Plantae (organism) |.

Examples of Organism concepts:

- | Streptococcus pyogenes (organism) | ;
- | Texon cattle breed (organism) | ;
- | Bacillus anthracis (organism) | ;
- | Lichen (plant) (organism) | .

S 5.8. Substance

The | Substance | *hierarchy* contains *concepts* that can be used for recording *active* chemical constituents of drug products, food and chemical allergens, adverse reactions, toxicity or poisoning information, and physicians and nursing *orders. Concepts* from this *hierarchy* represent general substances and chemical constituents of |Pharmaceutical / biologic product (product)| which are in a separate *hierarchy*. However, sub-hierarchies of | Substance | also include but are not limited to: | Body substance (substance) | (*concepts* to represent body substances); | Dietary substance (substance) |; | Diagnostic substance (substance) |.

Examples of Substance concepts:

- | Insulin (substance) | ;
- | Methane (substance) | ;
- | Chromatin (substance) | ;
- | Dental porcelain material (substance) | ;
- | Albumin (substance) | ;
- | Endorphin (substance) | ;
- | Acetaminophen (substance) | .

S 5.9. Pharmaceutical/biologic product

The | Pharmaceutical / biologic product | *hierarchy* is separate from the | Substance | *hierarchy*. This *hierarchy* was introduced as a top-level *hierarchy* in order to clearly distinguish drug products (products) from their chemical constituents (substances).

It contains *concepts* that represent the multiple levels of granularity required to support a variety of uses cases such as computerized provider *order* entry (CPOE), e-prescribing, decision support and formulary management. The levels of drug products represented in the *International Release* include Virtual Medicinal Product (VMP), Virtual Therapeutic Moiety (VTM), and Product Category. Additionally, US and UK drug *extensions* have been developed, which represent Actual Medicinal Products (AMPs).

S 5.9.1. Virtual Medicinal Product (VMP)

The most granular level is the Virtual Medicinal Product (VMP). The VMP is a representation at the level of generality that would appear on a physician's prescription. The product name, strength, and dose form are all represented in the *Fully Specified Name*. This level can be used to support providers with drug ordering in CPOE and e-prescribing use cases.

👉 **Example:** | Diazepam 5mg tablet (product) |

- (Name, Strength, Dose form).

S 5.9.2. Virtual Therapeutic Moiety (VTM)

The Virtual Therapeutic Moiety (VTM) level represents a more general level of granularity than the VMP level. VTMs include the product name but not formulation, dose or strength in the *Fully Specified Name*. The HAS ACTIVE INGREDIENT attribute (which relates the product to the | Substance | it contains) can be assigned to this level or to any of the *subtypes* of this level.

👉 **Example:** | Diazepam (product) |

All Virtual Medicinal Products (VMP) have a direct link to the Virtual Therapeutic Moiety (VTM) via an | is a | *relationship*.
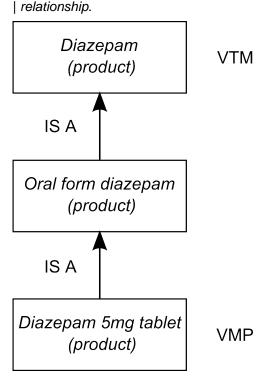

Figure 10: Example

There are additional levels in the | Pharmaceutical / biologic product | *hierarchy* that provide structure and organization . For example, some *subtypes* of VTM contain only Dose form information and not Strength.

☞ **Example:** *Concept* with granularity between that of a VTM and VMP:

- | Parenteral form epinephrine (product) |:

    - (Dose form, Name).

⑤ 5.9.3. Product category

A Product category *concept* supports a group of | Pharmaceutical / biologic product | related by their functionality mechanism of action or therapeutic use. | Product category | *concepts* typically describe common drug categories used in prescribing.

Examples of Product category concepts:
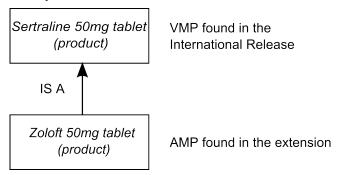
- | Sex hormone product (product) | ;
- | Mineralocorticoid preparation (product) | ;
- | beta-Blocking agent (product) | ;
- | Tissue plasminogen activator preparation (product) | .

⑤ 5.9.4. Actual Medicinal Products (AMPs)

Actual Medicinal Products can be represented in *extensions*. The AMP represents the single unit dose of a medicinal product that is (or has been) made or marketed by a specific manufacturer (trademarked brand name pharmaceutical products). Its *description* requires product name, strength, dosage form, flavor (where applicable) and manufacturer, but it does not include explicit information about packaging.

Because AMP *concepts* contain brand and country-specific information, they are not represented within the *International Release* of *SNOMED CT*, but may instead exist within an identified domain *extension* (contact your *IHTSDO National Release* Center Center for further information). Actual Medicinal Products in an *extension* have a direct link to their virtual equivalent in the *International Release* via the | is a | *relationship*.

Example:

```
┌───────────────────────┐
│ Sertraline 50mg tablet │    VMP found in the
│       (product)        │    International Release
└───────────────────────┘
            ▲
            │
          IS A
            │
┌───────────────────────┐
│   Zoloft 50mg tablet   │    AMP found in the extension
│       (product)        │
└───────────────────────┘
```

All *concepts* in the | Pharmaceutical / biologic product | *hierarchy* have a FSN tag of "(product)" regardless of their level of granularity.
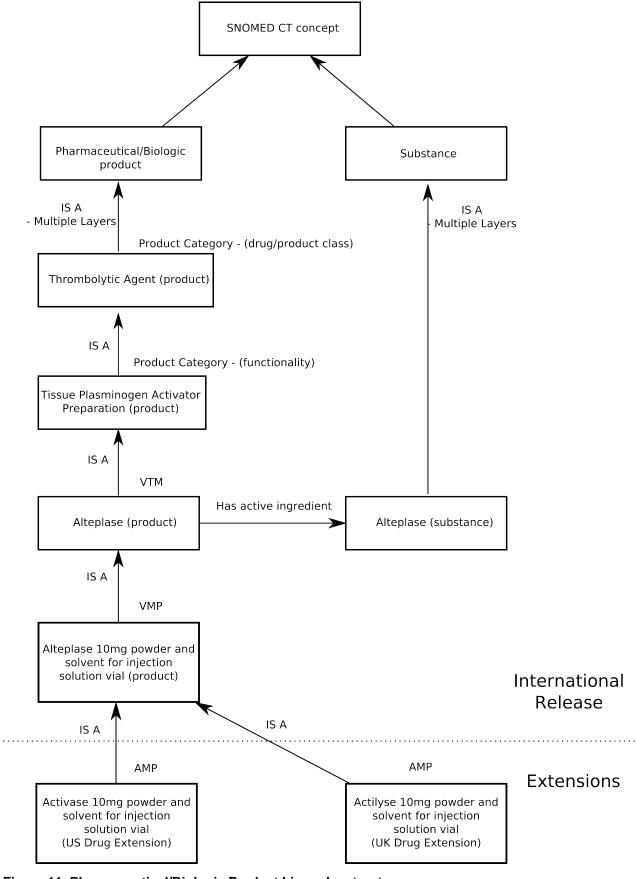
Figure 11: Pharmaceutical/Biologic Product hierarchy structure

S 5.10. Specimen

The | Specimen | *hierarchy* contains *concepts* representing entities that are obtained (usually from a patient) for examination or analysis. | Specimen | *concepts* can be defined by attributes which specify: the normal or abnormal body structure from which they are obtained; the procedure used to collect the specimen; the source from which it was collected; and the substance of which it is comprised.

Examples of Specimen concepts:

- | Specimen from prostate obtained by needle biopsy (specimen) | ;
- | Urine specimen obtained by clean catch procedure (specimen) | ;
- | Calculus specimen (specimen) | ;
- | Cerebroventricular fluid cytologic material (specimen) | .

S 5.11. Physical object

Concepts in the | Physical object | *hierarchy* include natural and man-made objects. One use for these *concepts* is *modeling* procedures that use devices (e.g.catheterization).

Examples of Physical object concepts:

- | Military vehicle (physical object) | ;
- | Implant, device (physical object) | ;
- | Artificial kidney, device (physical object) | ;
- | Latex rubber gloves (physical object) | ;
- | Book (physical object) | ;
- | Pressure support ventilator (physical object) | ;
- | Vena cava filter (physical object) | .

S 5.12. Physical force

The *concepts* in the | Physical force | *hierarchy* are directed primarily at representing physical forces that can play a role as mechanisms of injury.

Examples of Physical force concepts:

- | Spontaneous combustion (physical force) | ;
- | Alternating current (physical force) | ;
- | Friction (physical force) | .

S 5.13. Event

The | Event | *hierarchy* includes *concepts* that represent occurrences (excluding procedures and interventions).

Examples of Event concepts:

- | Flood (event) | ;

- | Bioterrorist attack (event) | ;
- | Earthquake (event) | .

S 5.14. Environments and geographic locations

The | Environment or geographical location | *hierarchy* includes types of environments as well as named locations such as countries, states, and regions.

Examples of Environments and geographic locations concepts:

- | Canary islands (geographic location) | ;
- | California (geographic location) | ;
- | Rehabilitation department (environment) | ;
- | Intensive care unit (environment) | .

S 5.15. Social context

The | Social context | *hierarchy* contains social conditions and circumstances significant to healthcare. Content includes such areas as family *status*, economic *status*, ethnic and religious heritage, life style, and occupations. These *concepts* represent social aspects affecting patient health and treatment. Some sub-hierarchies of | Social context | and *concepts* typical of those sub-hierarchies are shown in the following examples.

Examples:

- | Ethnic group (ethnic group) |:
  - | Afro-Caribbean (ethnic group) | ;
  - | Estonians (ethnic group) | .

- | Occupation (occupation) |:
  - | Bank clerk (occupation) | ;
  - | Carpenter, general (occupation) | .

- | Person (person) |:
  - | Employer (person) | ;
  - | Boyfriend (person) | ;
  - | Caregiver (person) | .

- | Religion / philosophy (religion/philosophy) |:
  - | Hinduism (religion/philosophy) | ;
  - | Orthodox Christian religion (religion/philosophy) | .

- | Economic status (social concept) |:
  - | Middle class economic status (social concept) | .

S 5.16. Staging and scales

This *hierarchy* contains such sub-hierarchies as | Assessment scales (assessment scale) |, which names assessment scales; and | Tumor staging (tumor staging) | , which names tumor staging systems.

Examples of Assessment scales (assessment scale) concepts:

- | Glasgow coma scale (assessment scale) | ;
- | Stanford Binet intelligence scale (assessment scale) | .

Examples of Tumor staging (tumor staging) concepts:

- | International Federation of Gynecology and Obstetrics (FIGO) staging system of gynecological malignancy (tumor staging) | ;
- | Dukes staging system (tumor staging) | .

S 5.17. Qualifier value

The | Qualifier value | *hierarchy* contains some of the *concepts* used as values for *SNOMED CT* attributes that are not contained elsewhere in *SNOMED CT*. Such a code may be used as the value of an attribute in a defining *Relationship* in *pre-coordinated* definitions, and/or as the value of an attribute in a *qualifier* in a *post-coordinated expression*. However, the values for attributes are not limited to this *hierarchy* and are also found in hierarchies other than | Qualifier value |.

For example, the value for the attribute | LATERALITY | in the *concept* shown below is taken from the | Qualifier value | *hierarchy*:

- | Left kidney structure | | LATERALITY | | Left | .

However, the value for the attribute | FINDING SITE | in the *concept* shown below is taken from the | Body structure | *hierarchy*, not the | Qualifier value | *hierarchy*.

- | Pneumonia | | FINDING SITE | | Lung structure | .

Examples of Qualifier value concepts:

- | Unilateral | ;
- | Left | ;
- | Puncture - action | .

S 5.18. Special concept

The Top Level *Concept* Code | Special concept | and its subclass codes provide a place for *concept* codes that are no longer *active* in the terminology.

The subclasses of | Special concept | are:

- | Navigational concept | ;
- | Inactive concept | .

[S] 5.18.1. Navigational concept

These *concept* codes are to be used only as nodes in a *Navigation Subset*. They are not suitable for data recording or aggregation.

The subclasses of | Navigational concept | have the following characteristics:

- They have no | is a | *subtypes*;
- They have no | is a | supertypes other than | Navigational concept |;
- They may be associated with other *concept* codes by the use of *Navigation Links*.

[S] 5.18.2. Inactive concept

These *concept* codes are no longer *current* within *SNOMED CT* and should not be used for encoding data. There is one hierarchical level which consists of these subclasses:

- | Reason not stated | ;
- | Duplicate | ;
- | Outdated | ;
- | Ambiguous | ;
- | Erroneous | ;
- | Limited | ;
- | Moved elsewhere | .

Each *inactive concept* code falls into one of these seven subclasses based upon its *ConceptStatus* value of 1, 2, 3, 4, 5, 6, or 10. There is no further subclassing of *inactive concepts*. Note that *concept* codes with a *ConceptStatus* value of 6 (Limited) were formerly considered *active*, but are now *inactive* and are included in the *inactive hierarchy*. This also means that the former confusing distinction between " *active*" and "*current*" no longer is required. " *Active*" and "*current*" now mean the same thing, and "*inactive*" and "non- *current*" also now mean the same thing.

[S] 5.18.3. Namespace concept

These codes have *integer* -valued names that are the *Extension namespace identifiers* that have been assigned.

[S] 5.19. Record artifact

A | Record artifact | is an entity that is created by a person or persons for the purpose of providing other people with information about events or states of affairs. In general, a record is virtual, that is, it is independent of its particular physical instantiation(s), and consists of its information elements (usually words, phrases and sentences, but also numbers, graphs, and other information elements). | Record artifact | need not be complete reports or complete records. They can be parts of larger | Record artifact |. For example, a complete health record is a | Record artifact | that also may contain other | Record artifact | in the form of individual documents or reports, which in turn may contain more finely granular | Record artifact | such as sections and even section headers.

5.20. Core metadata concept

Subtypes of | Core metadata concept | provide structural information for the *core* release data, including *concepts*, *descriptions* and *relationships*.

5.21. Foundation metadata concept

Subtypes of the | Foundation metadata concept | provide supporting metadata and structural information for *derivative* release structures including *Reference Sets.*

5.22. Linkage concept

Linkage *concept* codes are intended to link two or more other codes to each other to express compositional meanings. All *concept* codes that can be used as a *Relationship Type* are included under | Linkage concept |. The ones approved for use are the *Concept Model Attributes*. Implementation guidance is as yet quite limited for the other Linkage *concept* codes. Use of them should be regarded as non-standard, tentative and experimental, requiring extra care.

The | Linkage concept | *hierarchy* contains the sub-hierarchies:

- | Link assertion | ;
- | Attribute | .

👉 **Note:** For the RF2 release format, | Linkage concept | will no longer be a top level hierarchy, but will instead become a subclass of | SNOMED CT model component |.

5.22.1. Link assertion

The Link assertion sub - *hierarchy* enables the use of *SNOMED CT concepts* in *HL7* statements that assert *relationships* between statements. Currently this content supports the *UK NHS* Connecting for Health requirements for encoding of Statement *relationships* for the implementation of *HL7* Version 3 messaging in the UK *realm*.

Examples of Link assertion concepts:

- | Has reason | ;
- | Has explanation | .

5.22.2. Attribute

Concepts that descend from this sub - *hierarchy* are used to construct *relationships* between two *SNOMED CT concepts*, since they indicate the *relationship type* between those *concepts*. Some attributes (*relationship types*) can be used to logically define a *concept* (defining attributes). This sub - *hierarchy* also includes non-defining attributes (like those used to track *historical relationships* between *concepts*) or attributes that may be useful to model *concept* definitions but which have not yet been used in *modeling pre-coordinated concepts* in *SNOMED CT*.

Examples of Defining attributes:

- | is a | .
- | Concept model attribute |:
  - | Laterality | ;
  - | Procedure site | ;
  - | Finding site | ;
  - | Associated morphology | .

Examples of Non-defining attributes:

- | Concept history attribute | :
  - | REPLACED BY | ;
  - | SAME AS | .

- | Unapproved attribute | :
  - | Relieved by | ;
  - | Has assessment | .

Chapter

6

Structure and Technology Considerations

Topics:

- *Introduction*
- *SNOMED CT tables*
- *History*
- *SNOMED CT Subsets*
- *Cross Mappings*
- *Extensions*
- *SNOMED CT applications and services*

6.1. Introduction

The structure and technology behind SNOMED CT enables organizations to implement it and integrate it into their own clinical and business processes and applications. SNOMED CT offers additional capabilities to facilitate customization of an implementation to meet the unique requirements of an organization.

This section provides an introduction to SNOMED CT structure and technology, highlighting its core and extended capabilities. This overview is intended to provide project managers and others involved with SNOMED CT implementations a better understanding of technology requirements and support considerations for SNOMED CT implementation and maintenance. Topics addressed include:

- SNOMED CT data structure: SNOMED CT data components and their relationships, including the core table structure, as well as:

  - History
  - Subsets
  - Cross Mapping
  - Extensions

- SNOMED CT applications and services

Detailed information for each topic is available in the *SNOMED CT Technical Reference Guide* (TRG), *SNOMED CT Technical Implementation Guide* (TIG) and the *SNOMED CT Developer Toolkit*. See *Inventory of Documentation* on page 10 for descriptions of the content and target audiences for each available document.

6.2. SNOMED CT tables

SNOMED CT is distributed as a set of tab-delimited text files that can be imported into a relational database. The three tables shown below, the Concepts table, the Descriptions table, and the Relationships table, are commonly referred to as the "core" tables.

The association of a set of Descriptions and a set of Relationships to each Concept is implemented using the ConceptId which is the primary or foreign key in the three tables.
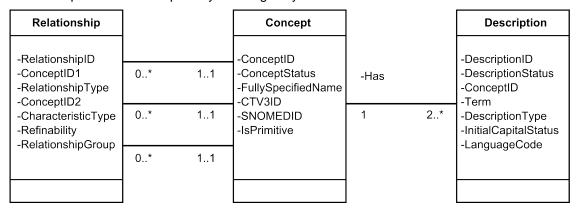
Relationship		Concept		Description
-RelationshipID -ConceptID1 -RelationshipType -ConceptID2 -CharacteristicType -Refinability -RelationshipGroup	0..* 1..1 0..* 1..1 0..* 1..1	-ConceptID -ConceptStatus -FullySpecifiedName -CTV3ID -SNOMEDID -IsPrimitive	-Has 1 2..*	-DescriptionID -DescriptionStatus -ConceptID -Term -DescriptionType -InitialCapitalStatus -LanguageCode

Figure 12: SNOMED CT table structure

6.2.1. The Concepts Table

The Concepts Table contains all the concepts in SNOMED CT. Each concept is represented by one row of the table. Each row of the Concepts Table contains the following fields:

- SNOMED CT concepts are identified by their *ConceptIds*, and all information about a SNOMED CT concept is ultimately linked to the *ConceptId*. *ConceptId* is the primary key of the Concepts Table.
- The original SNOMED RT identifier and original CTV3 identifier for each concept that originated in those terminologies. Any newly created SNOMED CT concept is assigned a SNOMED RT identifier and a CTV3 identifier. This allows users of SNOMED CT to work with legacy data coded with SNOMED RT or CTV3 codes.
- The *FullySpecifiedName* field appears in both the Concepts Table and the Descriptions Table. In the Concepts Table, it serves to provide a human-readable name for each concept.
- The *ConceptStatus* field indicates whether a concept is in active use or retired. This field flags concepts that have been retired so that data encoded with these concepts can be properly accessed and retrieved long after it has been coded.
- The *IsPrimitive* field indicates whether or not a concept has been flagged as primitive during the modeling process. This flag can be useful in advanced applications that take advantage of the description logic features of SNOMED CT (A more detailed description of fully defined and primitive concepts can be found in *User Guide Glossary* on page 91).

6.2.2. The Descriptions Table

This table relates the various terms used to name a single SNOMED CT concept. The Descriptions Table includes the following fields:

- *DescriptionId*: Each description has a unique *DescriptionId*, which serves as the primary key of this table.
- *DescriptionType*: This field indicates if the description is one of three types:

  - The *Fully Specified Name* (FSN): A term that uniquely and unambiguously identifies each concept in a human-readable way, just as the *ConceptId* uniquely identifies each term in a machine-readable way. There is only one Fully Specified Name for each concept in each edition.
  - The *Preferred Term*: Intended to represent the common way a concept is expressed in natural language by clinicians. In many cases it is a shortened version of the Fully Specified Name
  - *Synonyms*: Other terms that can be used to name a concept. The large numbers of synonyms in SNOMED CT provide flexibility of expression.

- *LanguageCode*: This field in the Descriptions Table associates each description with a particular language or dialect, such as UK English, Spanish, etc.

6.2.3. The Relationships Table

This table contains the relationships between SNOMED CT concepts. A Relationship in the table is stored as a combination of three concepts in the order: ConceptId1 RelationshipType ConceptId2. This is represented in the table by the following fields:

- *RelationshipId*: The RelationshipId uniquely identifies each set of three concepts in a relationship, and serves as the primary key of this table.
- *ConceptId1*: The first concept in the relationship
- *RelationshipType*: This is the type of relationship (either the IS A relationship or an attribute or a Historical or Additional relationship) that exists between two concepts.
- *ConceptId2*: The target concept in the relationship. Either the Parent concept in an IS A relationship or the concept that represents the value assigned in an attribute relationship.

The most common *RelationshipType* used in SNOMED is the IS A relationship (a.k.a. subsumption relationship, hierarchical relationship, supertype-subtype relationship, or parent-child relationship). When an IS A relationship is listed in the Relationships Table, it indicates that *Concept1* is a subtype of *Concept2*.

See the *Technical Reference Guide* for more information about SNOMED CT tables.

Figure 13: SNOMED CT Data Structure Summary

6.3. History

6.3.1. Component History - Introduction

The content of *SNOMED CT* evolves with each release. The types of changes made include new *Concepts*, new *Descriptions*, new *Relationships* between *Concepts*, new *Cross Maps*, and new *Subsets*, as well as updates and retirement of any of these *Components*. Drivers of these changes include changes in understanding of health and disease processes; introduction of new drugs, investigations, therapies and procedures; and new threats to health, as well as proposals and work provided by *SNOMED* users.

6.3.2. History Mechanism

The history mechanism involves the following tables:

- Component History Table
- References Table

The Component History Table includes any changes to SNOMED CT Components (Concepts, Descriptions, Subsets, Cross Maps). "Significant" changes generally require retirement of the component and addition of

replacement component(s). The retirement and addition are recorded in the history records. Changes designated as minor require only a history record to record the change.

The References Table provides a reference from an inactive SNOMED CT component (Concept moved to an Extension, Description, Subset or Cross Map Set) to a component that is current for the Release in which the first component is made inactive. The type of reference indicates the nature of the relationship between the two components. This is similar to the information that historical relationships provide for inactive Concepts.

6.4. SNOMED CT Subsets

6.4.1. Introduction

A Subset refers to a set of Concepts, Descriptions, or Relationships that are appropriate to a particular language, dialect, country, specialty, organization, user or context.

In its simplest form, the Subset Mechanism is a list of SNOMED identifiers (SCTIDs). Each SCTID refers to one component of SNOMED CT, that is, a member of the Subset (called a Subset Member). As an analogy, think of SNOMED CT as a book. A Subset is like an index entry pointing to a set of pages relevant to a particular topic.

The Subset Mechanism may be used to derive tables that contain only part of SNOMED CT. In some cases, these derived tables may also be centrally distributed (e.g. a release table containing only Descriptions for a particular International Edition).

A Subset is a value-added feature of SNOMED CT. Subsets provide important information for the use and implementation of SNOMED CT. The fact that a SNOMED CT Component belongs to a particular subset provides information above and beyond the Component itself.

SNOMED CT is a large terminology and subsets can define portions of the terminology for use by specific audiences. For example, a UK dialect subset for English may direct the user to descriptions for UK terms rather than all descriptions for English.

Subsets may also be used to specify simplified or shortened hierarchies for browsing, sometimes called "navigation hierarchies".

Note that it is up to the implementer to determine if a subset is used dynamically or statically, and whether the subset contents are given precedence or used exclusively. Refer to the SNOMED CT Technical Implementation Guide for more information.

Note that Subsets are not necessarily mutually exclusive. The contents of Subsets may overlap.

6.4.2. Subset table and file structures

A common file structure is used for all Subsets. This approach simplifies the release structure and installation process for all SNOMED users.

Subsets are released using two tables:

- Subsets Table

  - Each row in this table describes one release of a Subset.
  - This table includes SNOMED CT Subsets that are packaged together in the Subset Members table.

- Subset Members Table

  - Each row in this table represents one member of a Subset.
  - The member may be a Concept or a Description.
  - One or more Subsets may be packaged together in this table.

6.5. Cross Mappings

6.5.1. Introduction

Cross Mappings enable SNOMED CT to effectively reference other terminologies and classifications. Each cross map matches SNOMED CT concepts with another coding scheme that is called the "target scheme". The Cross Mapping mechanism enables the distribution of Cross Maps from SNOMED Clinical Terms in a common structure.

The cross mapping structure enables:

- Automatic mapping from one SNOMED CT Concept to a single appropriate matching code in the Target Scheme.
- Automatic mapping from one SNOMED CT Concept to a single collection of codes in a Target Scheme that together represent the same Concept.
- Manual choice from a set of options for mapping a SNOMED CT Concept to a Target Scheme with several possible ways of representing the same or similar Concepts (For Future Use).

The cross mapping structure does **not** enable:

- Mapping from post-coordinated collections of SNOMED CT Concepts to a single Target Code or a specific collection of Target Codes (e.g. mapping a combination of a disorder qualified by severity or a procedure qualified by urgency).
- Mapping from multiple fields in a patient record to a specific Target Code that represents a combination of characteristics (e.g. mapping a combination of a disorder, procedure and the age and sex of the patient to a single group code).

This structure is based on the practical experience of the Cross Mapping tables of Clinical Terms Version 3 (CTV3), one of SNOMED CT's source terminologies.

6.5.2. Cross Mapping tables

The SNOMED CT structure to support Cross Mapping includes three tables:

- Cross Map Sets Table: Each row in this table represents a Target Scheme for which Cross Maps are available.
- Cross Maps Table: Each row in this table represents one option for mapping a SNOMED CT Concept to a target code or set of codes in the Target Scheme.
- Cross Map Targets Table: Each row in this table represents a code or set of codes in the Target Scheme, which provides a mapping for one or more SNOMED CT Concepts.

6.6. Extensions

SNOMED CT is a deep and detailed clinical terminology with a broad scope. However, some groups of users will need additional Concepts, Descriptions or Subsets to support national, local or organizational needs.

The Extension mechanism is a structure that enables authorized organizations to add Concepts, Descriptions, Relationships and Subsets to complement the core content of the SNOMED CT International Release. One example of the Extension mechanism is for extensibility of SNOMED CT for the specialized terminology needs of an organization.

Goals of Extensions are to:

- Provide a structure where these Extensions maintain unique identification across organizations for data transmission and sharing, but share a common structure for ease in application development, and so that subsets can be constructed over a combination of International Release and extension content.
- Define a structure so that it is easy to submit, include, use, and migrate terminology developed as part of an extension into the International Release content.

When content overlaps the scope of SNOMED CT, it should be submitted to your IHTSDO National Release Center for consideration, so that other SNOMED CT users can also take advantage of this work. Using the extension structure can also helporganizations transfer responsibility for terminology to the IHTSDO or to another organization, subject to the terms of the Affiliate License.

6.7. SNOMED CT applications and services

SNOMED Clinical Terms is a terminological resource that can serve many roles in healthcare software applications. The IHTSDO supplies content that can be loaded into these applications, but it does NOT supply any of the software itself.

User requirements for these software applications will vary according to way in which they are used. Healthcare software applications usually address a particular set of requirements associated with one or more clinical and/or business processes. Detailed requirements for integrating SNOMED CT into a particular application inevitably depend upon intended uses, the perceptions of users and the technical environments in which they are implemented.

The following examples illustrate a few possible types of implementation:

- A SNOMED CT enabled clinical record system incorporating clinical data entry, decision support, links to knowledge bases, sophisticated analysis, order-report message interfaces, support for record communication or sharing, etc.
- A data warehouse storing and analyzing records expressed with SNOMED CT encoded concepts.
- A diagnostic departmental system sending reports that include SNOMED CT encoded concepts to other systems.
- A hand-held data collection device used for input of a limited range of frequently used coded concepts.
- A decision support system using SNOMED CT concepts to represent guidelines and protocols for distribution to other systems.
- A system designed to enable the creation of queries for use in analysis of data held by various other systems, some of which contain SNOMED CT encoded data.
- A coding system mapping SNOMED CT encoded concepts (entered manually or read from an electronic record) to administrative groupings or classifications such as DRGs or ICD10.
- A system designed to support design and/or implementation of messages that convey specified information using a specified set of SNOMED CT concept identifiers.

The *SNOMED CT Technical Implementation Guide* (TIG) provides information and guidance for software professionals responsible for designing, developing and implementing SNOMED CT enabled software applications. The TIG describes the technical requirements and design issues for integrating SNOMED CT into new and existing applications.

Chapter

7

Changes and historical notes

Topics:

S

- *EPISODICITY no longer modeled in active content*
- *ONSET and COURSE retired*
- *Dose form values moved*
- *Renaming the context/situation hierarchy*
- *Domain change for measurement/evaluation attributes*
- *Move of findings to events*

𝒢 7.1. EPISODICITY no longer modeled in active content

|EPISODICITY| originated in the *National Health Service Clinical Terms Version 3* where it was used not to specify the first episode of a disease for a patient but rather, the first time a patient presented to their general practitioner (GP) for a particular disorder. A first episode of asthma was not intended to represent the first time a patient had asthma, but rather the first time a patient presented to their GP with asthma. | EPISODICITY | has been removed from existing *concepts* and is no longer used in *pre-coordinated* definitions. It can still be used in *post-coordination* as a *qualifier*.

𝒮 7.2. ONSET and COURSE retired

In earlier releases, there were two attributes named | ONSET | and | COURSE |. These were *retired* because they could not be used reproducibly. While | ONSET | was intended to specify the rapidity of onset or the temporal pattern of presentation for a given condition, it was easily confused with the attribute | COURSE | used to represent the duration of a condition. There was not consistent agreement between observers making this distinction.

𝒮 7.3. Dose form values moved

The *concept* 105904009 | Type of drug preparation (product) | and its *subtypes* were moved to the *Qualifier* value *hierarchy* as of the July 2007 release. 105904009 | Type of drug preparation (qualifier value) | better represents these *concepts* because they are not products.

𝒮 7.4. Renaming the context/situation hierarchy

The *hierarchy* named 243796009| situation with explicit context (situation) | was called | context-dependent category | until the July 2006 release. The *hierarchy* was renamed to better describe the meanings in this *hierarchy*.

𝒮 7.5. Domain change for measurement/evaluation attributes

In releases prior to July 2009, six *attributes* were approved for use for | measurement procedure | only. For the July 2009 release, the *domain* for these *attributes* was expanded to | evaluation procedure |. See *Measurement procedures and laboratory procedures* on page 89 for a definition and full discussion of | evaluation procedure | and | measurement procedure |.

S 7.6. Move of findings to events

In January 2006, a number of *concepts* from the | Clinical finding | *hierarchy* were moved to the *Event hierarchy*. The attributes used to define those *concepts* when they were *descendants* of |Clinical finding| were retained after the *concepts* were moved to the *Event hierarchy*. Additional editorial policies for the use of attributes in the *Event hierarchy* have yet to be established.

Chapter

8

Miscellaneous Topics

Topics:

- *Terms Prefaced with Symbols*
- *Negation*
- *Measurement procedures and laboratory procedures*
- *Structure of the SNOMED Clinical Terms Identifier (SCTID)*

S 8.1. Terms Prefaced with Symbols

There are some *terms* in *SNOMED CT* that are prefaced with a symbol in square brackets. These *concept* codes were inherited from *CTV3* and were used to facilitate mapping to ICD-10. They have all been *retired* by moving them to the *UK NHS extension*, and are not recommended for use in clinical records.

Explanations of these *term* prefixes are as follows:

Table 74: Term Preface Symbols

[X]	*Terms* starting with [X] were initially used in the Read codes in the 1995 release, in *order* to identify ICD-10 *terms* that were not present in ICD-9.
[D]	*Terms* starting with [D] are also from *CTV3*, and identify *terms* contained in ICD-9 Chapter XVI 'Symptoms signs and ill-defined conditions' and ICD-10 Chapter XVIII 'Symptoms signs and abnormal clinical and laboratory findings, not elsewhere classified'. The [D] meant that in CTV3 the code was intended for use in a diagnosis field in the record, even though the *term* meaning is not a kind of disease.
[V]	A *term* starting with [V] identifies *concept* codes derived from ICD-9 'Supplementary classification of factors influencing health *status* and contact with health services (V codes)', and ICD-10 Chapter XXI 'Factors influencing health *status* and contact with health services (Z codes)'.
[M]	A *term* starting with [M] identifies Morphology of Neoplasm *terms* present in *ICD9* and ICD 10.
[SO]	A *term* starting with [SO] signifies that the *term* was contained in OPCS-4 (Office of Population, Censuses and Surveys - Classification of Surgical Operations and Procedures - 4th Revision) Chapter Z subsidiary classification of sites of operation in *CTV3*.
[Q]	A *term* starting with [Q] identifies temporary qualifying *terms* inherited from *CTV3*.

G 8.2. Negation

The meaning of some *concept* codes in *SNOMED CT* depends conceptually on negation (e.g. absence of *X*, lack of *X*, unable to do X etc).

𝒢 8.2.1. Negation and Context

The | Situation with explicit context | *hierarchy* is intended to manage this kind of semantic situation. The *concept model* allows a *concept* code in the | Situation with explicit context | *hierarchy* to be related to the | Clinical finding | about which context is asserted. For example, | Absence of nausea and vomiting (situation) | is modeled as a | Situation with explicit context | in which the finding of | Nausea and vomiting (disorder) | is absent.

The inclusion of negated meanings introduces complications into *query* formulation, machine classification, and reasoning tasks. The inclusion of a NOT logical operator into the *SNOMED CT* compositional model could simplify *modeling* of negated meanings. The *current* release of *SNOMED CT* does not directly support classification using this operator, but some *modeling* formalisms in *current* use today (including database formalisms, *Description Logic* formalisms) include a NOT operator as a fundamental *modeling primitive*.

𝒢 8.2.2. Known Problems with Negation

There is still work to be done in moving all appropriate *concept* codes to the | Situation with explicit context | *hierarchy*. In particular, many negated meanings are still represented by *concept* codes that are under a | Clinical finding | parent. In the July 2008 release, a significant number of *subtypes* of | Functional finding (finding) | were changed from *primitive* to *sufficiently defined*. Sufficiently defining some *concept* codes in this subhierarchy (e.g. | Unable to stand (finding) |, and | Does not retract tongue (finding) |) resulted in incorrect subsumption related to negation. For example | Does not retract tongue (finding) | autoclassifies as a *subtype* of | Does not move tongue (finding) |; with correct representation of negation, the *subtype relationship* would be inverted, so that | Does not move tongue (finding) | would imply | Does not retract tongue (finding) |. While this negated content ultimately needs to be moved to the | Situation with explicit context | *hierarchy*, the incorrect direction of subsumption relations for negated meanings also occurs in the | Situation with explicit context | *hierarchy*.

This is a limitation of the *classifier* currently being used, rather than a fundamental limitation of the *concept model*. The *classifier* will currently place *concept* codes in the wrong subsumption *relationship* when they are negated. As another example, it will infer that | Adnexal tenderness absent (situation) | | Is a | | Tenderness absent (situation) | This is an incorrect direction of subsumption and needs to be reversed. To achieve the correct inferences in queries and reasoning systems, | Situation with explicit context | *concept* codes with a finding context of known absent or *subtypes* thereof should have their | Is a | *relationships* reinterpreted by reversing the *Concept1* and *Concept2* of the | is a | *relationships*. This is a temporary fix, and will be addressed systematically in a future release so that such *ad hoc* solutions will not be necessary.

𝒢 8.3. Measurement procedures and laboratory procedures

Measurements are observations that designate the value of a property, quality or *attribute* that is inherent in the individual or population (or their specimens, by proxy), according to specified rules. Although measurement is generally considered to be the observation of a quantitative value for a quality or *attribute*, measurements need not necessarily result in a numeric or ordinal result. In other words, detection (detected/not detected) and identification (selection of one or more possibilities from a specified set by detecting their presence or absence) are considered types of measurement procedures. This is admittedly a broad definition, but does require that measurement procedures be done according to pre-determined rules and that they specify the property, quality or *attribute* that is being measured. Measurement can definitely be done by physical examination techniques as well as by laboratory techniques, but physical examination by itself is not a kind of measurement. Of course, several of the routine procedures carried out during a physical examination involve measurements of properties such as height, weight, vital signs, *range* of motion, deep tendon reflexes, etc. However, the interpretation of primary observations as being normal or abnormal is not considered a kind of measurement, since normality is not an inherent property, quality or attribute that can be measured

but rather a second-level interpretation of where the primary value lies relative to a *range* determined externally to the individual.

8.4. Structure of the SNOMED Clinical Terms Identifier (SCTID)

S 8.4.1. SCTID Data Type

The *SCTID* data type is a 64-bit *integer*, which is subject to the following *constraints*:

- Only positive *integer* values are permitted;
- The minimum permitted value is 100,000 (6 digits);
- The maximum permitted value is 999,999,999,999,999,999 (18-digits);
- As a result of rules for the partition-identifier and *check-digit*, many *integers* within this range are not valid *SCTIDs.*

S 8.4.2. SCTIDs and Extensions

If the partition-identifier indicates that the *SCTID* is part of an *Extension* the next seven-digits (from the right) are a *namespace* -identifier (see *SCTID for an Extension Component*). *Namespace* -identifiers are allocated to organizations which areauthorized to issue *Extensions*. They enable unique *SCTIDs* to be issued by many organizations and allow each *SCTID* to be traced to an authorized originating organization .
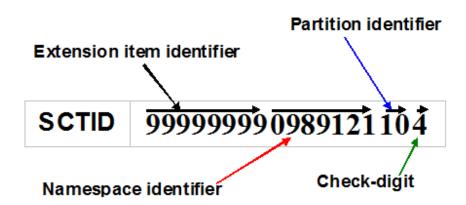

Figure 14: SCTID for an Extension Component

Chapter

9

User Guide Glossary

Topics:

- *Attribute*
- *Attribute value pair*
- *Browser*
- *Check digit*
- *Component*
- *Concept*
- *Concept equivalence*
- *ConceptId*
- *Concepts table*
- *Core*
- *Core table*
- *Cross map*
- *CTV3ID*
- *Description*
- *DescriptionId*
- *Descriptions table*
- *Dialect*
- *Enabled application*
- *Extension*
- *Fully defined*
- *Fully specified name*
- *Hierarchy*
- *History mechanism*
- *SNOMED CT Identifier*
- *International release*
- *Language*
- *Language subset*
- *Mapping mechanism*
- *Modeler*
- *Modeling*
- *NamespaceId*
- *PartitionId*
- *Postcoordinated expression*
- *Precoordinated expression*
- *Primitive*
- *Qualifying characteristic*

- *Realm*
- *Relationship*
- *Relationship type*
- *RelationshipId*
- *Relationships table*
- *Release*
- *Root concept*
- *Root metadata concept*
- *SNOMED*
- *SNOMED Clinical Terms*
- *Sufficiently defined*
- *Subset*
- *Synonym*
- *Top level concept code*
- *Top level metadata code*

9.1. Attribute

An *attribute* represents a characteristic of the meaning of a *concept* or the nature of a refinement.

👉 **Note:** An *attribute* has a name which is represented by a *concept*. All the *concepts* that can be used to name *attributes* are *subtypes* of the *concept* | *concept model attribute* |. An *attribute* is assigned a value (*attribute value pair*) when used in the definition of a *concept* or in a *post-coordinated expression*. The permitted *attribute values* (*range.*) for an *attribute* depend on the *attribute name* and on the *domain* of the *concept* being refined.

👉 **Example:** |Finding site|

Concept Model Attribute

Relationship Type

Role

9.2. Attribute value pair

An *attribute-value pair* is made up of an *attribute name* and an *attribute value*. *Attribute value* pairs allow additional types of information to be represented in a generic way without altering the underlying structure or information model. *SNOMED CT relationships* are use *attribute value* pairs to represent *relationships* using one *concept* identifier as an *attribute name* (the *relationship type*) and another *concept* identifier as the value. Similarly each *refinement* in a *post-coordinated expression* consists of an *attribute name* and a value each of which is expressed as a *concept* identifier.

9.3. Browser

A computer application or software tool used for exploring and searching terminology content. A typical *SNOMED CT browser* can locate *concepts* and *descriptions* by identifiers and by searching the text of *description terms*. Various views of located *concepts* may be displayed including the set of related *descriptions*, the hierarchical *relationships* and other defining *relationships*.

SNOMED CT browser

9.4. Check digit

The *check-digit* is the final (rightmost) digit of the *SNOMED CT Identifier* (*SCTID*). It can be used to check the validity of *SCTIDs*. Clinical information systems can use the *check-digit* to identify *SNOMED CT* codes that have been entered incorrectly (typo errors, etc). It is calculated using the Verhoeff algorithm.

9.5. Component

Refers to any item identified by an *SCTID* in the main body of *SNOMED CT*, or in an authorized *Extension*. The *partition identifier* indicates the type of component referred to by that *SCTID*. Each *component* is a uniquely identifiable instance of one of the following:

- *Concept*
- *Description*
- *Relationship*

- Other components in *Release Format 1*:

    - *Subset*
    - *Subset Member*
    - *Cross Map Set*
    - *Cross Map Target*

SNOMED CT component

9.6. Concept

A clinical idea to which a unique *ConceptId* has been assigned.

The *term concept* may also be used informally with the following meanings:

- The *concept* identifier, which is the key of the *Concepts Table* (in this case it is less ambiguous to use the *term* "conceptId" or "*concept* code");
- The real-world referent(s) of the *ConceptId*, that is, the class of entities in reality which the ConceptIdrepresents (in this case it is less ambiguous to use the *term* "meaning" or "code meaning").

SNOMED CT concept

9.7. Concept equivalence

Equivalence is the state of two *SNOMED CT concept* codes or *post-coordinated expressions* having the same meaning. *Concept equivalence* can occur when a *post-coordinated expression* has the same meaning as a *pre-coordinated concept* code; or when two different *post-coordinated expressions* have the same meaning.

9.8. ConceptId

A *SNOMED CT Identifier* that uniquely identifies a *Concept* (meaning).

👉 **Example:** For the meaning named | Pneumonia (disorder) |, the *ConceptId* is 233604007.

👉 **Note:** Field name in SNOMED CT Release Format 1

9.9. Concepts table

A table that includes all *SNOMED CT concept* codes. Each *concept* code is represented by a single row.

👉 **Note:** Component Table name in SNOMED CT Release Format 1

9.10. Core

Core has different meanings depending on context. A "*core* component" is a *SNOMED CT Component* released by the *IHTSDO*, and the "*core namespace*" is the *namespace* used for *SCTIDs* released by the *IHTSDO*. It is policy that all *core* components have *SCTIDs* from the *core namespace*.

SNOMED CT core

Core table

SNOMED CT core table

SNOMED CT core file

Core file

9.11. Core table

Refers to the *SNOMED CT Concept*, *Relationship* and *Description* Tables.

👉 **Note:** Component Table name in SNOMED CT Release Format 1

SNOMED CT core table

9.12. Cross map

A *Cross Map* is a reference from a *Concept* code to a *Cross Map Target*. Each *Cross Map* is represented as a row in the *Cross Maps Table*. It links a single *SNOMED CT concept* code to one or more codes in a target classification (such as ICD-9-CM) or terminology. A *Concept* code may have a single *Cross Map* or a set of alternative *Cross Maps*

9.13. CTV3ID

A five-character code allocated to a meaning or term in *Clinical Terms Version 3* (*CTV3*, previously known as *Read Codes*). Each row in the *SNOMED CT concepts* table has a field for the corresponding *concept* code from *CTV3*.

👉 **Note:** Field name in SNOMED CT Release Format 1

☞ **Note:** The *CTV3ID* and *SNOMEDID* fields are no longer supported in *Release Format 2*. Instead a *|Simple map (reference set)|* is used to document the link between legacy codes and *SNOMED CT*.

☞ **Note:** The *CTV3ID* field should no longer be relied upon for mapping to and from the *Read Codes*. Additional mapping work in the UK identified some anomalies and resulted development of more flexibility table for *Read Code* Mapping

9.14. Description

A human-readable phrase or name (*Term*) associated with a particular *SNOMED CT concept* code. Each of the *descriptions* in *SNOMED CT* is given a separate row in the *Descriptions Table*. Each *Description* is assigned a unique *DescriptionId* and connects a *Term* and a *Concept*.

SNOMED CT description

9.15. DescriptionId

A *SNOMED CT Identifier* that uniquely identifies a *Description*.

☞ **Note:** Field name in SNOMED CT Release Format 1

9.16. Descriptions table

A data table consisting of rows, each of which represents a *Description*.

☞ **Note:** Component Table name in SNOMED CT Release Format 1

9.17. Dialect

A *language* modified by the vocabulary and grammatical conventions applied to the *language* of a particular geographical or cultural environment.

9.18. Enabled application

A software application designed to support the use of *SNOMED CT*.

SNOMED CT enabled application

SCT enabled application

SNOMED CT enabled application

SNOMED CT-enabled application

SNOMED-enabled application

SNOMED CT application

SNOMED CT application

9.19. Extension

A data table or set of data tables that is created in accordance with the structures and authoring guidelines applicable to *SNOMED CT*. An *extension* is ordinarily edited, maintained and distributed by an organization other than the *IHTSDO*. *components* in *extensions* are identified using *extension SCTIDs*, which are structured to ensure that they do not collide with other *SCTIDs*, and can be traced to an authorized originator.

SNOMED CT extension

9.20. Fully defined

See *Sufficiently defined.*

9.21. Fully specified name

A *term* unique among *active Descriptions* in *SNOMED CT* that names the meaning of a *Concept* code in a manner that is intended to be unambiguous and stable across multiple contexts.

👉 **Note:** Field name in SNOMED CT Release Format 1

9.22. Hierarchy

An ordered organization of *concept* codes linked together through | is a | *relationships. Concept* codes linked to their more general parent *concept* codes directly above them in a *hierarchy Concept* codes with more general meanings are usually presented as being at the top of the *hierarchy* and then at each level down the *hierarchy* code meanings become increasingly more specific or specialized . Formally, a *hierarchy* is represented as a directed acyclic graph.

9.23. History mechanism

The *history mechanism* is the information distributed with *SNOMED CT* designed to track the history of changes to its logic definitions and *descriptions*. The *history mechanism* is supported by two distribution tables:

- *Component History Table*
- *References Table*

9.24. SNOMED CT Identifier

A unique *integer* identifier applied to each *SNOMED CT component* (*Concept*, *Description*, *Relationship*, *Subset*, etc.). The *SCTID* includes an item identifier, a *check-digit* and a *partition identifier*. Depending on the *partition identifier* is may also include a *namespace identifier*.

SNOMED CT identifier

SCTID

9.25. International release

International release... to be defined.

SNOMED CT International release

SNOMED CT International edition

International edition

9.26. Language

For purposes of *SNOMED CT* translations, a *language* is a vocabulary and grammatical form that has been allocated an ISO639-1 *language* code. See also *dialect*.

9.27. Language subset

SNOMED CT can be translated into virtually any human *language* or *dialect*. These translations attach new *language*-specific *terms* as *descriptions* of existing *concept* codes and may also use existing *descriptions* if translation is not necessary. A *language subset* is a set of references to the *descriptions* that are members of a *language* edition of *SNOMED CT*. Additionally, data in the *language subset* specifies the *DescriptionType* of each *description* (*Fully Specified Name*, *Preferred Term* or *Synonym*).

9.28. Mapping mechanism

A set of data structures for representing cross-links to other terminologies and classifications. The *Mapping Mechanism* data structures are distributed as three tables:

- *Cross Map Sets Table*
- *Cross Maps Table*
- *Cross Map Targets Table*

9.29. Modeler

A person who directly edits the logic definitions and other structures of the terminology. Also sometimes called Clinical Editor or Terminology Manager.

SNOMED CT modeler

Modeller

SNOMED CT author

9.30. Modeling

The process of editing logic definitions to reflect the meaning intended by the fully specified name.

SNOMED CT modeling

Modelling

SNOMED CT authoring

9.31. NamespaceId

A *Namespace* is a virtual block of identifiers allocated for creating *Extensions* to *SNOMED CT*. The *Namespace Identifier* is a seven digit number that identifies the *Namespace* and is used as part of each *Extension SCTID*. When an organization creates an *extension* to *SNOMED CT*, the new components in the *extension* need to be identified as part of that particular organization *extension*. *IHTSDO* allocates a *Namespace Identifier* to the organization which then uses it to form its *Extension SCTIDs*. Most *SCTID*'s issued by *IHTSDO* for the *International Release* are from the *core namespace* as determined by the *partition identifier* portion of the *SCTID*, and do not use a *Namespace identifier*

Namespace id

Namespace identifier

Namespace

9.32. PartitionId

A pair of digits that indicate whether an *SCTID* identifies a *Concept*, *Description*, *Relationship*, *Subset*, History, or *Extension* component. The partition-identifier consists of the second and third digits from the right of the *SCTID*.

Partition id

Partition identifier

9.33. Postcoordinated expression

Representation of a clinical meaning using a combination of two or more *concept* identifiers is referred to as a *post-coordination*. Some clinical meanings may be represented in several different ways. *SNOMED CT* technical specifications include guidance for transforming logical *expressions* to a common *canonical form*.

Example: *SNOMED CT* includes the following *concepts*:

Fracture of bone (conceptId=125605004)
FINDING SITE (conceptId= 363698007)
Bone structure of femur (conceptId= 181255000)

SNOMED CT also includes a *pre-coordinated concept* for this disorder: Fracture of femur (conceptId= 71620000)

It is possible to represent | fracture of femur | in different ways:

71620000 (*pre-coordinated expression*)
and
125605004 : 363698007 = 181255000 (*post-coordinated expression*)

Post-coordinated

Post-coordination

Postcoordinated

Postcoordination

9.34. Precoordinated expression

Representation of a clinical meaning using a single *concept* identifier is referred to as a *pre-coordination*. In constrast, *expressions* that contain two or more references to *concepts* identifiers are said to be *post-coordinated*.

Precoordinated

Pre-coordination

Precoordinated

Precoordinated expression

Precoordination

9.35. Primitive

An *expression*, which may be just a single *concept* code, is *primitive* when its logic definition does not sufficiently express its meaning so that its *subtypes* can be computably recognized . A *concept* code's logic definition is made up of its defining *relationships* to other *concept* codes, via attributes and | is a | *relationships*. *Primitive concept* codes also do not have the defining *relationships* that would be needed to computably distinguish them from their parent or sibling *concepts*. For example, if the *Concept* "Red sports car" is defined as [is a=car] + [color =red] this is *Primitive* but the same definition applied to the *Concept* "Red car" is *sufficiently defined*.

9.36. Qualifying characteristic

An *attribute-value relationship* associated with a *concept* code to indicate to users that it may be applied to refine the meaning of the code. The set of qualifying *relationships* provide syntactically correct values that can be presented to a user for *post-coordination*. Example: 'Revision *status* ' = 'First revision' is a possible *qualifying characteristic* of 'Hip replacement'. A *qualifying characteristic* is contrasted with a *defining characteristic*. It is referred to in *CTV3* as a '*Qualifier*.

Qualifier

9.37. Realm

A sphere of authority, expertise, or preference that influences the range of *components* required, or the frequency with which they are used. A *Realm* may be a nation, an organization , a professional discipline, a specialty, or an individual user.

9.38. Relationship

An association between two *Concepts* (each identified by a *ConceptId*). The nature of the association is indicated by a RelationshipType. Each *Relationship* is represented by a row in the *Relationships Table*.

SNOMED CT relationship

9.39. Relationship type

The nature of a *Relationship* between two *Concepts*. *Relationship Types* are represented in *SNOMED CT* by *Concept* codes. In the *Relationships Table*, the RelationshipType field contains the *ConceptId* for the *concept* in *SNOMED CT* that forms the *relationship* between two other *concepts* (ConceptId1 and ConceptId2). For defining and qualifying *relationships*, the *Relationship Type* is an *Attribute* code. RelationshipType should not be confused with *CharacteristicType*.

👉 **Note:** Field name in SNOMED CT Release Format 1

9.40. RelationshipId

A *SNOMED CT Identifier* that uniquely identifies a *Relationship*. RelationshipId is the key of the *Relationships Table*. Each row in the *Relationships Table* represents a *relationship* triplet (ConceptId1 RelationshipType - ConceptId2).

👉 **Note:** Field name in SNOMED CT Release Format 1

9.41. Relationships table

A data table consisting of rows, each of which represents a *Relationship*.

👉 **Note:** Component Table name in SNOMED CT Release Format 1

9.42. Release

A field in the *Component History Table* which indicates the *SNOMED CT release* in which a *component* was added or changed.

SNOMED CT release

Release version

SNOMED CT edition

ReleaseVersion

9.43. Root concept

The single *concept* that is at the top of the | SNOMED CT Concept | hierarchy.

9.44. Root metadata concept

The single *concept* that is at the top of the | SNOMED CT Model Component (metadata) | hierarchy.

👉 **Note:** Most of the data in the metadata hierarchy is only relevant to *Release Format 2*. Therefore, this *concept* may not be present in some *Release Format 1* files.

> **Root metadata code**

9.45. SNOMED

An acronym for the **S**ystematized**No**menclature of **Med**icine originally developed by the College of American Pathologists and now owned and maintained by the *IHTSDO*. *SNOMED Clinical Terms* is the most recent version of this terminology. It was preceded by *SNOMED RT* and *SNOMED International.*

9.46. SNOMED Clinical Terms

SNOMED CT is a clinical terminology maintained and distributed by the *IHTSDO*. It is considered to be the most comprehensive, multilingual healthcare terminology in the world. It was created as a result of the merger of *SNOMED RT* and *NHS Clinical Terms Version 3*.

> **SNOMED CT**

9.47. Sufficiently defined

A *concept* is *sufficiently defined* if its logic definition is sufficient to computably recognize (automatically subsume) all its *subtypes*. The logic definition must also differentiate the *concept* from its immediate supertype(s). A *concept* which is not *sufficiently defined* is *primitive*. For example, if the *concept* 'Red car' is defined as [is a=car] and [color =red] it is *sufficiently defined* but the same definition applied to the *Concept* 'Red sports car' is *primitive*.

9.48. Subset

A group of *components* (e.g. *Concepts*, *Descriptions* or *Relationships*) that share a specified common characteristic or common type of characteristic. *Subsets* represent information that affects the way the *components* are displayed or otherwise accessible within a particular *realm*, specialty, application or context.
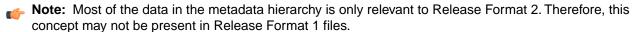
9.49. Synonym

A *Term* that is an acceptable alternative to the *Preferred Term* as a way of expressing a *Concept*. *Synonyms* allow representations of the various ways a *concept* may be described. *Synonyms* and *Preferred Terms* (unlike FSNs) are not necessarily unique. More than one *concept* might share the same *Preferred term* or *Synonym*

9.50. Top level concept code

A *Concept* Code that is directly related to the *Root Concept* Code by a single *Relationship* of the *Relationship Type* | is a |. All *Concept* Codes (except for metadata *concepts*) are descended from at least one Top-Level *Concept* Code via at least one series of *Relationships* of the *Relationship Type*"| Is a | ".

9.51. Top level metadata code

A *Concept* Code that is directly related to the *Root Metadata Code* by a single *Relationship* of the *Relationship Type* | is a |. All Metadata *Concept* Codes are descended from at least one Top-Level Metadata *Concept* Code via at least one series of *Relationships* of the *Relationship Type*"| Is a | ".

> **Note:** Most of the data in the metadata hierarchy is only relevant to Release Format 2. Therefore, this concept may not be present in Release Format 1 files.

Chapter
10

SNOMED CT Background

Topics:

- *Acknowledgments of Contributors to SNOMED CT*

10.1. Acknowledgments of Contributors to SNOMED CT®

SNOMED CT was originally created by the College of American Pathologists.

SNOMED CT has been created by combining *SNOMED RT* and a computer based nomenclature and classification known as *Clinical Terms Version 3*, formerly known as the *Read Codes Version 3*, which was created on behalf of the U.K. Department of Health and is Crown copyright.

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